

# **Diseases of The Brain and Nervous System**

## **(A Health Education Guide)**

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## **A HEALTH EDUCATION GUIDE**

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**DR. SUDHIR V. SHAH**

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The recommendations and information in this book are appropriate in most cases; however, they are not a substitute for medical diagnosis. For specific information concerning your personal Neurological condition, I suggest that you consult a doctor. The names of drugs appearing in the book are given for informational purposes only. Their inclusion does not imply any endorsement, nor does the omission of any drug, alternative therapy indicate my disapproval.

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# **FOREWORD**

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## **Diseases of the Brain and Nervous System (A Health Education Guide)**

Neurological illnesses account for nearly 20% of the burden of illnesses in the community. Sadly, there is not much awareness about the neurological illnesses and the patient and the family members are suddenly overcome with anxiety and apprehension, and do not know how to cope with neurological problems. Dr. Sudhir Shah's book serves to give the necessary information required. The original book was in Gujarati language, but he has taken pains to bring out this English edition.

It is a fairly comprehensive book, dealing with all practical problems faced in neurology. It gives the description of the illness along with the management. I am confident that the reader will find it extremely useful and it will help the patients and relatives to cope with various neurological problems. He has also emphasized on preventive aspects of the illness and side effects of the commonly used drugs and in particular care to be taken for drugs used for prolonged periods.

This book should be useful not only for the patient and the caretakers but also for the medical students and the physicians and those involved in the management of neurological illnesses.

I enjoyed reading the book and I am confident that it will have a wide reception. I should compliment Dr. Sudhir Shah for having spared his time from his busy practice and academic work to write this book.



B. S. Singhal

Professor & Head Department of Neurology  
Bombay Hospital Institute of Medical Sciences  
Mumbai.  
April 10, 2002.

## **PREFACE**

The human brain is probably the most complex object in the universe. It comprises of 100 billion neurons or nerve cells linked in networks that give rise to an amazing array of cognitive functions such as intelligence, creativity, emotion, consciousness and memory. Over the past few decades, intense research in clinical and basic neuroscience has enabled us to gradually unravel the biological foundations of complex mental functions and diseases that impair these functions. This book is aimed at providing an overview of clinical aspects of these findings.

In my dealings with patients and their relatives for more than a decade I have seen first-hand how anxious they are to gather information on diseases that afflict the brain. Much of my personal experience in this matter comes from my years of practising medicine in my clinic “Neurology Centre” in Ahmedabad, Gujarat as well as in the renowned V S General Hospital, Dr. Jivaraj Mehta Hospital and Sterling Hospital. Since such information was not available in Gujarati (a local language of Gujarat state) or in other languages in a comprehensive manner in one place, I got the inspiration that I should write something about the diseases of the brain and nervous system. Due to lack of time, this project was put aside for sometime. In September 1999, a few lectures of mine on various diseases of the brain were arranged on Akashvani - Radio during the morning programme ‘Pahelu Sukh’ - and on Doordarshan - Television ‘Swasthaya Sudha’. Thus, I was inspired to write about major brain disorders and this project took shape in the form of a “Health Education Guide”.

I would like to mention here that in the month of August 2000, the first edition of this book in Gujarati language was released by his Excellency the Governor of Gujarat, Shri Sundersingh Bhandari in the presence of dignitaries of Ahmedabad city, including Hon. Health Minister Shri Ashok Bhatt. There was a tremendous appreciation from all quarters including patients and their relatives, physicians, family doctors and well-wishers. Subsequently an expanded second edition followed. Senior neurologist and Prof. Dr. B. S. Singhal (Bombay Hospital), with whom I had an opportunity to learn neurology, advised me to make an English version of the book so that people from other

states also can be benefited and thus this book is before you. I am very much thankful to Dr. Singhal who has gone through this

English version and has blessed me by writing a foreword for this book. However, this effort to present English version may have scope for improvisation.

It can be understood that the main aim of this book being imparting knowledge about healthcare and awareness regarding diseases to the general public, in depth information according to the medical science has not been given. Further, I have tried to keep language simple and I have avoided too much technical details. Still, I hope, enough essential information for a layman will be available in this book. An attempt has been made to include the latest researches and drugs in this book, but it should be kept in mind that new researches are going on continuously and new discoveries are being made everyday. Here, I would like to clarify that medicines are to be taken only under the advice of the doctor and one should not try to self medicate.

The assistant physicians of my clinic, especially Dr. Shivani Patel, have taken deep interest in the making of Gujarati book. I am grateful to them. The contribution of my wife Chetna Shah has also been tremendous and it was only due to her excellent time management, that I could write about all these diseases properly, in spite of constraints of time. My friend Shri Upendra Divyeshvar has taken personal interest and has read each and every manuscript right from the beginning to the publishing of the book. I must also acknowledge due contributions made by my friends Dr. Parimal Tripathi (Neurosurgeon) and Dr. . Hemant Patel (Neuroradiologist) in providing appropriate material in their respective fields. I am grateful to my teacher, Prof. Dr. G. G. Oza who was kind enough to give constructive suggestions about the Gujarati version of this book and to write an introduction for that book.

After reading this book if at least a few readers will awaken to the concept of prevention of diseases and if timely diagnosis is able to save even a few lives, I shall feel happy.

I shall sincerely pray that may Almighty God bless us all!

**19 August, 2002,**  
Ahmedabad, India.

**DR. SUDHIR V. SHAH**  
M.D., D.M. (Neurology)

**Dedicated to :**

Those who really need the help  
as well as to all those who are  
eager to help the needy.

**I am grateful to :**

- My Parents and family members
- My Teachers
- Friends and well wishers

**Dr. Sudhir V. Shah**

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## **NOTE FROM PUBLISHER**

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In a pathbreaking effort, an eminent Neurologist has addressed the growing need of human civilization, the need to know complexities of Nervous System and create a strong linkage in the mechanism of Preventive & Social Medicine.

Dr. Sudhir V Shah is reflecting in this book, a simple and lucid presentation of his experiential hindsight, for the cause of Health Education.

**Team Spirit**

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# 1

## AN OVERVIEW OF THE NERVOUS SYSTEM

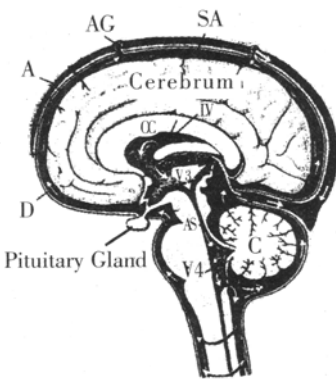
The **Nervous system** comprises of the brain, the spinal cord, the nerves emanating from them and their innervations of muscle fibres. The human race is superior and special to the other living beings due to the unique anatomy and physiology of human nervous system. Especially the cortex of the brain (the grey layer of the brain surface) is highly evolved and complex. Other organs of the human beings are similar or even weaker as compared to those of the other animals, but the human race proves superior because of the exceptional mental power & ability, as well as logic, memory and vocabulary all due to the cortex of the brain. The cortex consists of approximately 100 billion neurons. According to an estimate, an average person uses about 5 to 10 percent of his brain capacity, but a genius uses his brain up to 15 percent. Therefore it can be said that any person can become a genius by learning how to use his brain more and putting it frequently to task.

An adult human brain is approximately 1200 to 1400 grams in weight. Though our brain weighs only 1 to 2 percent of total body weight, it uses up approximately 25 percent of the oxygen intake of the body and 70 percent of the total glucose available to the body. The lower group of chordate animals do not have a developed organ like brain and therefore their functions are autonomous. So they don't feel pain, e.g. a fly etc. A large head, in effect does not mean more intellectual capacities. The structure of the brain matters more than its size.

## 2 ● An Overview of the Nervous System

The outer layer of the brain surface is grey in color and is called **cortex**, whereas the inner layer is white and is known as **white matter**.

The brain rests securely inside the skull and is covered by three membranes to protect against friction. These membranes are called the **meninges**. They are **dura matter** (outer most), **arachnoid matter** (middle) and pia matter (innermost). The inflammation of these membranes is called **meningitis** e.g. tubercular meningitis. The chambers inside the brain are known as **ventricles**. There are four ventricles viz. two **lateral ventricles**, a **third ventricle** and a **fourth ventricle**.



Cerebrum	: Larger Brain
D	: Dura matter
A	: Arachnoid matter
SA	: Subarachnoid Space
AG	: Arachnoid Granulation
C	: Cerebellum-Smaller Brain
CC	: Corpus Callosum
LV	: Lateral Ventricle
V3	: Third Ventricle
V4	: Fourth Ventricle
AS	: Aqueduct of Sylvian

The watery fluid inside these chambers is called **C:S.F.** It extends right from the centre of the brain to the spinal cord, as well as in the outer membranes of the brain and spinal cord. Any infection or hemorrhage in the brain can be

diagnosed easily by the examination of the **C.S.F** extracted from the spinal cord by a procedure called Lumbar **puncture**. The functions of **C.S.F** range from assisting the **metabolism** of the brain to the prevention of friction: As the cells of the brain perform complex functions, they need extra nourishment and oxygen. This calls for a faster and greater blood supply. If the supply of blood and oxygen to the cortex stops completely for more than five minutes, the cortex stops functioning permanently, resulting in death.

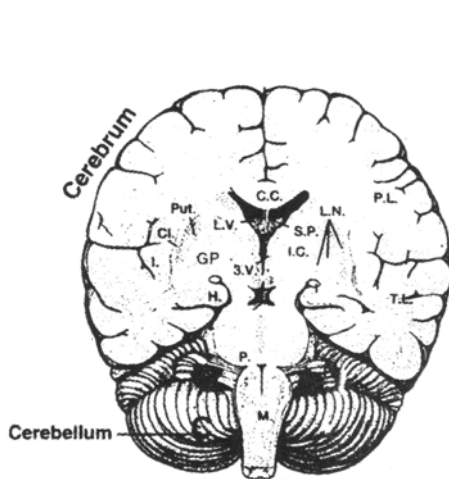
The brain can be divided into three parts viz.

1. **Cerebrum**, which occupies the larger portion of the skull. It is divided into two - left and right - hemispheres. The part joining the two hemispheres is known as **corpus callosum**.
2. **Cerebellum** is located in the posterior region of the skull and is divided into two - left and right - parts. Its primary function is to maintain the equilibrium of the body.
3. The brain stem, which joins the two sides of the brain, consists of **mid-brain, pons** and **medulla oblongata**, which truncate into the spinal cord.

**The cerebrum can be subdivided into four parts as per their functions:**

- (1) Frontal (The anterior part)
- (2) Parietal (The lateral upper portion)
- (3) Temporal (The lateral lower portion)
- (4) Occipital lobes (The posterior part)

#### 4 ● An Overview of the Nervous System

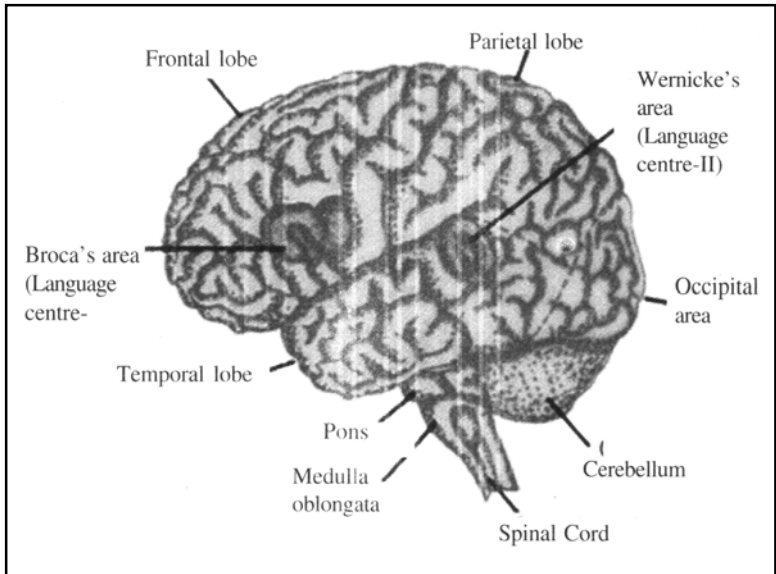


#### **Cerebrum : Larger Brain**

- C - Cerebellum**
- CC - Corpus Callosum**
- GP - Globus Pallidus**
- Put - Putamen**
- LN - Lentiform Nucleus**
- H - Hippocampus**
- IC - Internal Capsule**
- I - Insula**
- P - Pons**
- M - Medulla**
- PL - Parietal Lobe**
- TL - Temporal Lobe**
- LV - Lateral Ventricle**
- 3V - Third Ventricle**
- SP - Septum Pellucidum**

The right side of the brain is responsible for the motor and sensory functioning of the left side of the body and the opposite is true for the left-brain. The left-brain is also responsible for the linguistic expressive ability. The frontal lobe is basically responsible for the movements of the limbs, the personality and the behavior of an individual. The parietal lobe analyzes emotions and is also associated with mathematical powers. The temporal lobe and the limbic system are associated with memory as well as basic instincts, and according to some it can be the seat of special powers like the sixth sense, etc. The centre for hearing is also located here. Occipital lobe is analytic centre in the brain for vision. The left side of the brain of a right handed person (who uses his right hand for writing, eating, throwing etc.) is dominant and contains the centre for language, mathematical and logical

abilities and therefore, can be considered the technical brain of the person. The right brain is associated with sensitivity, creativity and imagination etc. It is worth understanding that brilliant people use the right side of the brain more efficiently.



## **BRAIN**

The location of psyche (mana) in the brain is a controversial issue. According to an opinion mana is present in each cell. However, others believe that the mana may exist either in the temporal lobe, in the limbic circuit, or in the pineal gland of the brain. In fact, there is no anatomical location for the mana. It is actually a complex biochemical and electromagnetic process and it is the limitation of our science and brain that we do not have the proper understanding of this subject. The same thing can also be said for the soul.

The brain also has important cellular clusters namely **thalamus** and **basal ganglia**, chemical imbalance in these centres causes diseases like Parkinson's disease, Chorea, Dystonia etc.

Similarly, **Hypothalamus** is an important centre and is the final control point of the **sympathetic** and the **parasympathetic** nervous system. It is associated with functions of our involuntary muscles, as well as physical processes like stress. This type of nervous system autonomously controls the extremely important functions of the heart, intestines, eyeballs, blood pressure, respiration etc. **Pituitary gland**, the master controller of all the endocrine glands, is also located in the brain. It regulates the entire hormonal system of the body in an amazing manner. Apart from this, there is an incredible network of various important neurotransmitters like Dopamine, Noradrenalin, GABA, Serotonin, Acetylcholine, Endorphin and Enkephalin in the brain and the entire nervous system for the transmission of impulses to and fro. These important neurotransmitters communicate through a series of receptors.

We have thus studied the anatomy of the brain, but brain has some amazingly unique features also, which make man superior to all living beings. There is a kind of electrical impulse emanating from the cells of the brain, which is rhythmic and constant. **This is an electrical process.**

This electrical impulse travels chemically across one nerve cell to the other through neurotransmitters and receptors which form an amazing network and can transmit information from one part to another in a 1000th fraction of a second. **This is a chemical process.**

The brain cells handle metabolism like other cells. **This is a biological process.** Transmission of messages from one person's mind to the other, as in telepathy **can be called an electronic process.** Moreover, the human brain is endowed with developed features like thinking, intelligence, the power to differentiate between good and bad, memory, creativity, etc. At the same time the brain has emotions like care, anger, likes-dislikes and love. Importantly the **brain governs all the basic instincts** like hunger, sleep, fear, reproduction etc. Senses like vision, taste, smell, touch and hearing are under the command of brain. Further we are able to communicate our thoughts very easily through language.

Is the entity called psyche (mana) not a part of the brain itself? Though anatomically the heart is situated in the chest, the way poets have described the emotional heart it appears that in fact they are referring to the mind.

Can we ever expect any of the man-made super computers to have all these features? The amazing thing is that we ourselves can think about our own brain, analyze it; but the one, who has created us, has discreetly left us in the dark about him. Again a human limitation.

The electric impulses of the brain can be detected with the help of an Electroencephalogram (**E.E.G.**). The electrical impulse generated by the posterior part of the brain during waking with eyes closed is known as **alpha wave**. The frequencies measure 8 to 13 Hz. Normally the frontal cortex generates the **beta rhythm** measuring 14 to 40 Hz. At times **theta activity** can be detected in the temporal regions measuring 4 to 7 Hz. and in children it is far more developed. **Delta activity** in an adult is always abnormal but sometimes

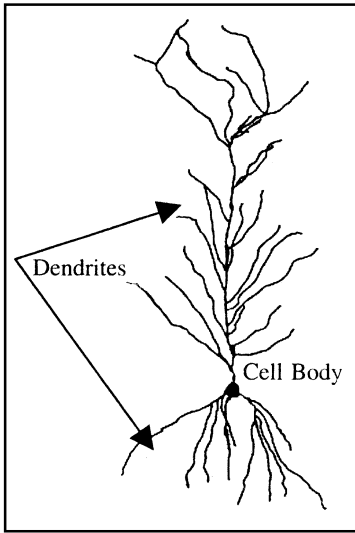
can be noted in children while they are asleep. Otherwise the delta activity usually indicates disease of the brain.

In the past few decades, mental maladies have come to be recognized as problems of the brain, and antidotes have emerged as the treatment of choice. Regardless of how one feels about the biological basis of psychiatry today, two facts must be acknowledged. The essence of who we are is encoded in our brain, and brain changes account for the alterations of thought, mood, and behavior that occur in mental illness. The key issue is not whether mental illness is really neural in nature. It is instead the nature of the neural changes that underlie mental problems, and the manner in which treatment should proceed. These sections provide a broad framework of the basic concepts and terms necessary to understand the fundamental processes underlying brain function. For those who love details, following paragraphs may be interesting.

### **Basic unit - a neuron & neural organisation**

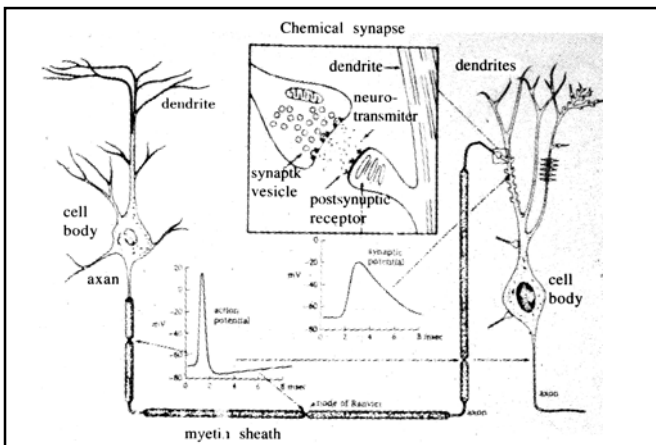
As mentioned earlier, the Nervous System comprises of the brain, the spinal cord, the nerves emanating from them and their innervations of muscle fibres (i.e. peripheral nervous system). The brain immediately confronts us with its great complexity. The human brain weighs only 1200 to 1400 gms. but contains about 100 billion neurons. Although that extraordinary number is of the same order of magnitude as the number of stars in the Milky Way, it alone cannot account for the complexity of the brain. A major part of the complexity arises from the rich diversity of nerve cells, or neurons, which the famous neuroanatomist Ramon y Cajal described as “the mysterious butterflies of the soul”.





Neurons, or nerve cells, are the basic building blocks of the brain. A neuron has three main parts - a cell body containing the nucleus, dendrites which are specialized branches for receiving information from other neurons, and axons which are specialized branches for sending out information to other neurons. A neuron that has been excited conveys information to other neurons by generating electrical impulse known as

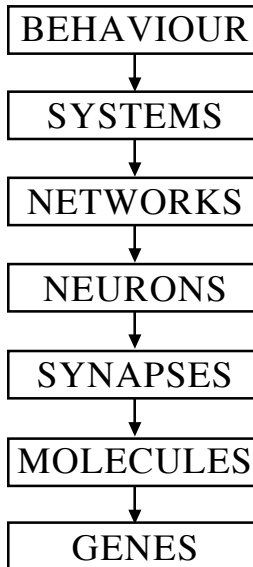
action potentials. These signals propagate like waves down the length of the cell's single axon and are converted to chemical signals at synapses, the contact point between neurons. When the impulse reaches the axon terminals of the presynaptic neuron, it induces the release of neurotransmitter molecules.



Transmitters diffuse across a narrow cleft and bind to receptors in the postsynaptic membrane. Such binding leads to the opening of ion channels and often, in turn, to the generation of action potentials in the postsynaptic neuron. This, in short, is how neurons communicate.

Many different kinds of neurotransmitters have been identified in the brain, and this variety has enormous implications for brain function. This level of analysis at the synaptic level is particularly relevant for psychiatric and neurological disorders that shed light on the workings of the mind. Further insight into the chemical basis of thinking and behavior depends on obtaining more precise data at multiple levels of neural organization - from the mind all the way down to molecules.

### **Levels of Neural Organization**



Neuroscience has rapidly emerged as a frontier area of cutting - edge research due to major discoveries at all of these levels of investigation - starting from psychiatry at one end to molecular neurobiology and neurogenetics at the other. The power of the molecule-to-mind approach is evident in many recent advances in the pharmacologic treatment of many debilitating mental disorders such as schizophrenia, anxiety, amnesia, etc.

### **COMMON DISEASES :**

After understanding the basics of the brain, we will now classify the common diseases of the brain and nervous system:

- |   |   |   |
|---|---|---|
| 1 | Altered Consciousness                       | Loss. of the cognitive state of the brain, coma - Loss of consciousness etc.  |
| 2 | Epilepsy                                    | excessive electrical stimulus   |
| 3 | Stroke                                      | (1) interruption in blood supply to the brain; Paralysis (2) - blood vessel rupture in the brain; Hemorrhage - bleeding |
| 4 | Brain Trauma                                | Injuries to the brain due to trauma - concussion, Contusion   |
| 5 | Brain Tumor                                 | Meningioma, Gliomas   |
| 6 | Infective diseases of the brain (Non-viral) | Meningitis, Abscess   |

## 12 ● An Overview of the Nervous System

- |    |  |   |
|----|--|---|
| 7  | Viral diseases of the brain                                | Encephalitis, AIDS  |
| 8  | Diseases of the White Matter of the Brain                  | Demyelinating disease e.g. Multiple Sclerosis (MS)                |
| 9  | Nutritional deficiency, hormonal or metabolic diseases     | Metabolic Encephalopathy  |
| 10 | Congenital diseases caused by defective genes of the brain | Phakoma, mental retardation, deformities                          |
| 11 | Degenerative diseases of the brain                         | Parkinsonism, Alzheimer dementia and other degenerative disorders |
| 12 | Diseases of the spinal cord                                | Myelopathy  |
| 13 | Neuropathy : diseases of the nerves                        | AIDP, Leprosy   |
| 14 | Diseases of the muscles                                    | Myopathy  |
| 15 | Myasthenia Gravis etc.                                     |   |

The above mentioned diseases are known as neurological disorders. A neurologist or any experienced physician can treat them. Diseases of the psyche (mana) are called psychiatric disorders e.g. depression, anxiety, psychosis, neurosis, personality problem, psychosexual diseases etc. A qualified psychiatrist should treat these diseases. Normally in psychiatric diseases investigations like CT scan, E.E.G. and Lumber Puncture are normal. Many a times there can be similar symptoms creating confusion. For instance a change in the personality of a patient may either be due to depression or brain tumor (frontal or corpus callosal region). This can result in serious lapse in diagnosis. Therefore, in each psychiatric case a detailed history as well

as physical examination is essential. If in doubt, it is always better to get a test or two (like CT Scan or E.E.G) done, rather than label the patient a psychiatric case in haste. Fortunately, such errors are extremely rare.

At times head injuries in cases of road accidents, falling from a height, or injury due to an instrument, demand immediate emergency treatment. In such cases it is essential that the patient is immediately shifted to a hospital without wasting any time, and given emergency treatment by a neurosurgeon.

After this basic information about the brain, we will now try to understand the various diseases of the brain in detail, in the subsequent chapters. I would like to clarify that above mentioned psychiatric disorders being out of context, they are not discussed here.

**Finally, a most important point** - It has been observed from experience that, though timely, correct diagnosis and proper medications are important for curing a patient, there are **other equally important factors** to bring a **patient** to a **state of total healing & health** which are unfortunately not being given proper importance in modern medicine.

It is important for the patient to have **faith** in his doctor and have **will power, a desire to live, a positive attitude** and a **disciplined and simple lifestyle**, for a quick and complete recovery. This apart, the **sympathy of the doctor** towards his patient, his **honest dedication** towards his profession as well as his **skill and high character** are vital. Also the care and kindness of nursing staff in the ward are equally important.

The **care and warmth** of family members, friends and relatives, **prayers**, the social atmosphere of the home and **accurate information** regarding the disease also play important role in the restoration of the health of the patient. All these points are worth taking into consideration and due **emphasis** should be given to each of them, in the **management** of a patient. In short, the aim should be healing of a patient and not merely eradication of the disease - symptoms.



# 2

## NEURORADIOLOGY - THE IMAGING OF THE BRAIN

A doctor normally diagnoses and treats the patient through observations of symptoms, history etc. Many a times when it becomes necessary to know the location, extent and damage caused by a disease lying inside the body, radiology- neuroradiology becomes helpful and necessary. Radiology-neuroradiology consists of Screening, X-Rays, Ultrasound, CT scan, and MRI etc.

### **X-Ray :**

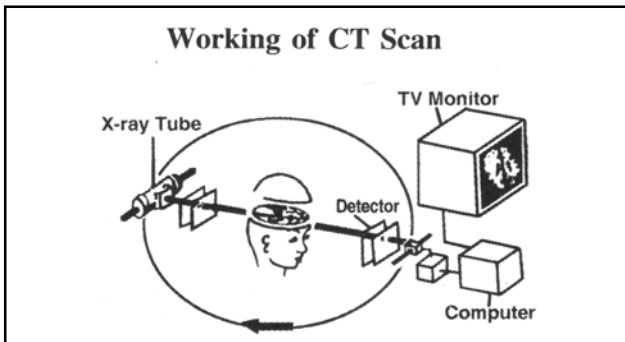
The “miraculous rays” X-Rays which could look-make structures inside the body were discovered in 1895 by a German scientist Mr: Roentgen. Thereafter these rays have been used in all possible innovative ways in the medical field. Sunrays, X-Rays, Microwave, Radio waves are all electro magnetic rays in scientific terminology. The only differentiating factor between them is their energy- content. Radio and television waves do not have much energy and so though they are present all around us in innumerable numbers, they cannot harm us and we are still alive. The energy from the X-Rays is 10,000 to 15,000 times more powerful than light and therefore can penetrate through objects. An amazing fact of nature is that the human eye can perceive only the sun rays and the rest of the rays are invisible to us.

The common X-Rays only give a rough picture of the skull or a one dimensional picture, but the depth of any feature cannot be judged, e.g. if there is a tumor inside the brain its exact location as well as the depth of the abnormality cannot be judged by X-Rays.

### **C T Scan : (Computed Axial Tomography)**

X-rays are used to give us a picture of different parts of the body. However, since we are now discussing about the diseases of the brain, it is necessary to know how X-Rays are helpful in this context. In the previous chapter we learned that the brain is well protected in the skull and therefore X-Rays are only able to give us the information of the skull. In-depth information regarding the inner structure cannot be obtained. The CT scan machine invented by a British Scientist Honsfield solved this problem. CT scan or CAT Scan is Computed Axial Tomography. CT scan also uses the X-Ray technology but with the help of the computer a three-dimensional view of the body is created. If there is a tumor in the brain, its depth and position can be determined by dividing the brain into imaginary parts like slices of bread, and each part is X-Rayed from various angles. The computer then calculates and creates a three-dimensional picture, which determines the depth and the size of the tumor very accurately. Thus, the minutest of changes inside the brain can also be determined with the help of the CT scan.

The diagram below explains how a photograph is taken with the help of a CT Scan.





### **CT Scan Machine :**

The CT Scan Machine is like a cubical box and is called Gantry. Within this box lies a two feet long circular tunnel. The stretcher like table on which the patient lies, can be moved in all directions upward, downward and side ways. The part of the body to be examined is kept at the center of the tunnel. The X-Ray tube lies in the middle of the tunnel, and rotates in a circular motion photographing the body part from each angle. These photographs are reflected on the detector, a computer carries out accurate calculations, divides the area into slices and then with the help of laser camera photographs are taken. The entire procedure takes about 15 to 30 minutes and during this time the patient has to lie still.



**CT Scan Machine**

On an average twenty photographs are taken on a 14" × 17" X-Ray film, which are interpreted by the radiologist and a report is made. A CT scan can gives detailed information

of organs right from the brain to the spinal cord and lungs to the stomach, so it is necessary to write exactly which body part is to be scanned. The scanning procedure is painless and the patient just has to lie down still for a short period of time. In the diseases of brain like tumor or infection, a special drug called the Contrast Agent is injected intravenously to figure out the circulation of blood inside the diseased part. This iodine-based drug (Iodinated contrast) sometimes can make a person nauseate or temporarily increase his body temperature. However, the patient becomes normal within a short period of 1 to 2 minutes. Therefore, the patient is advised to fast for three hours prior to the contrast CT Scan. A patient suffering from allergy, asthma, kidney disorder or thyroid disease can suffer a reaction in contrast CT Scan, so in these cases, a non-ionic dye is used to prevent a reaction. A pregnant woman should inform the doctor of her condition prior to the examination. CT Scan has no side effects except those caused by radiation, so the relatives and friends of the patient are not allowed inside the CT Scan room and the rest of the body of the patient is kept covered.

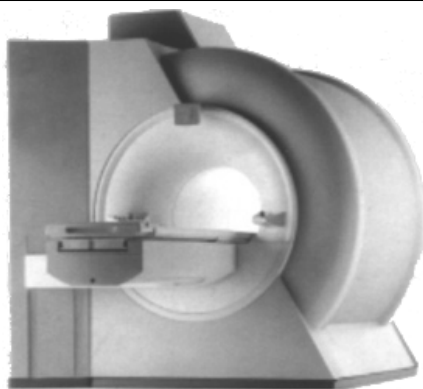
CT Scan has now become a preliminary diagnostic procedure for the diseases of the Brain and is now available at all the cities of district level in India and abroad. The average expenses of a CT scan roughly range from Rs. 1700 to 2000.

The CT scan can offer only limited information about the structures like the white matter of the brain and the spinal cord etc. In 1972, a scientist called Damadian discovered the use of magnetic field in the examination of the human body. Advanced computers are used to photograph the brain by

using powerful magnetic fields. This is known as the Magnetic Resonance Imaging (M.R.I.). MRI has proved very beneficial in the examination and diagnosis of diseases like the brain tumor, paralysis, white matter disease, congenital disorders, and disease of the nervous system e.g. multiple sclerosis and the examination of the minutest and innermost parts of eyes and ears.

### **MRI Machine :**

The MRI machine is cylindrical in shape, made of a powerful magnet. The patient lies in the tunnel formed in this cylinder. This magnet is 1000 times more powerful than the magnetic field of the earth. The power of the machine is determined through a measuring unit called Tesla. Normally the machine is configured as 0.2T, 0.3T, 0.5T, LOT and 1.5T. As the Tesla (power) increases, the accuracy, speed and minuteness of the machine also increase. Superior quality of machines use Helium gas to maintain the magnetic field and therefore the MRI machine has to be placed in an air-conditioned room.



**Magnetic Resonance Imaging Machine**

Like C T Scan, MRI can also be used for the examination of organs ranging from the brain to spinal cord, stomach, kidney, lungs, bones, muscles etc. The patient is positioned in such a way that the organ to be examined remains at the centre of the machine. Here the X-Rays are not used, instead radio frequency waves and strong magnetic field are used, this eliminates the fear of harmful radiation. Hydrogen protons are present in the water, which are present in a large quantity in the body. According to the principles of MRI, radio frequency waves and magnetic waves excite these protons. Each cell has a different number of protons and with the help of radio signals and advanced computers one can accurately calculate the various numbers of protons and thus differentiate each and every type of cell which can be photographed from every angle, with the help of a laser camera on a 14" x 17" photo film. This can easily differentiate between the white and the grey matter of the brain. On a photo plate roughly 16 to 20 photographs can be taken and the entire MRI consists of 4 to 5 such sequences. Each sequence lasts for about 5 to 8 minutes. Thus, in 30 to 45 minutes, 80 to 100 photographs of the brain from the different angles (X, Y, Z, axis) can be taken, which an expert radiologist analyzes and a report is given. This can be considered as an amazing gift of modern medical science to mankind.

During MRI test, the gradients of the machine make a lot of sound The sound can be muffled by using cotton balls, earplugs or earphone. Sometimes music is also played in the room. Since the patient has to lie down in an enclosed cylinder, some of them may feel claustrophobic. Such patients may be given mild anesthesia. Latest machines have an open magnet and the machine structure is open and so the patients

feel less claustrophobic. In some diseases, a special drug (contrast) has to be used to specify some defects; this drug has very few side effects.



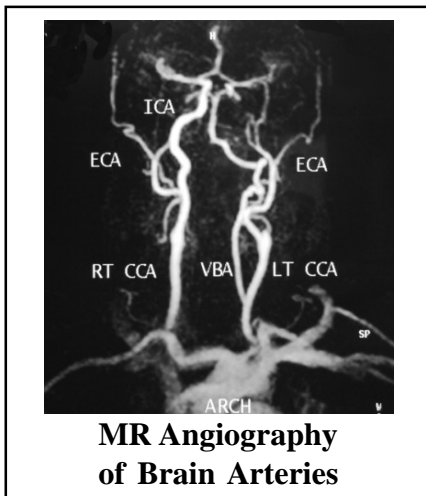
**MRI of Spinal Cord**

The MRI scan is much more advanced compared to the CT scan. First of all, an X-Ray is not used in MRI and so it is far less risky than CT scan during pregnancy. Just as we have seen earlier, in CT scan only bread slice cuts (axial) can be seen, while in MRI one gets a three dimensional (X, Y, Z) view; hence a complete picture is seen. The spinal cord can be minutely seen only by an MRI. Because of the strong magnetic field, things like watch, credit card, pen, rings etc. are not permitted in the MRI room. Patients who have a pace maker in their heart or any other electronic gadget in their body cannot undergo MRI. New research has made diffusion and perfusion MRI possible. This makes the diagnosis of hampered blood circulation in any part of the brain in minutes, so prompt treatment can prevent disease like paralysis.

Functional MRI is a discovery that can differentiate various areas of brain associated with movement, memory, speech, emotions etc. The major benefit of this discovery is in the planning of surgery and radiotherapy. The important centers in the brain can be avoided during surgery and the patient can be saved from permanent disability.

The cost of MRI is roughly Rs.5000 to 7000 and this facility is now available in all major cities of India.

Angiography is the examination of the arteries and veins that carry blood to the various parts of the body. Now-a-days, even a layman is also aware of the angiography of the heart. The blood vessels of the brain are also investigated in a similar manner.



The Digital Subtraction Angiography (DSA) is used for carrying out the angiography of the brain in many diseases of the brain, like constriction of blood vessels, arteriosclerosis, aneurysms, AV malformation etc. In this

procedure a catheter is introduced from the vein in the thigh. The catheter is pushed inside along with the blood flow. With the help of X-Ray and the computer monitor, the catheter is made to enter the vessels of the brain. After that a special drug (contrast medium) is injected. As the drug enters the bloodstream, its progression in the blood vessels is seen live on a monitor and if necessary, with the help of X-Rays the blood vessels are also visualized from various angles. In Digital Subtraction Angiography, an X-Ray of the brain is taken before starting the procedure. Another X-Ray is taken after the introduction of the contrast medium and the differences in the vessels and brain seen in both the X-Rays are used for diagnosis. If the Lumen of the carotid artery, which passes across the neck and supplies blood to the brain, becomes narrow due to arteriosclerosis, it can be widened with the help of a balloon. This is known as carotid angioplasty.

The risk factor of the angiography of the brain is similar to the angiography of the heart. Certain nominal risks are very much there, but they can be tackled. The investigation of the blood vessels is possible by totally non-risky methods too, but the information gained by them is 5-10% less accurate. These methods include, Color Doppler, CT Angiography, and MRI Angiography etc. Color Doppler gives complete information regarding the Carotid artery. The diameter of the Artery, the pressure flow of the blood and the deposits in the wall can be determined easily using simple Sonography. MRI Angiography can minutely examine the arteries and veins without the use of a catheter and is now exceedingly used as a primary investigative tool for blood vessels. As in MRI, this investigation also requires

for the patient to simply lie down on the investigation table. Science, technology and the modern computers have brought innovative advancements in the field of radiology at a very fast pace. PET SCAN (Positron Emission Tomography) can give much advanced information regarding certain diseases and can be used for better treatment of the patient. However this diagnostic tool is not easily available. But the use of the SPECT Scan for the investigation of the efficiency and metabolism of the brain is becoming increasingly rampant.

The invention of the radiation and the X-rays is not only important in the field of health, but is useful in other sectors too. Till now, 15 Nobel prizes have been awarded to various inventors doing researches using X-Rays. This can be considered a parameter to determine the extent to which X-rays are useful in human life. More research and new inventions are still taking place in this field. We hope that the advancement of this technology gives maximum health benefits to mankind.

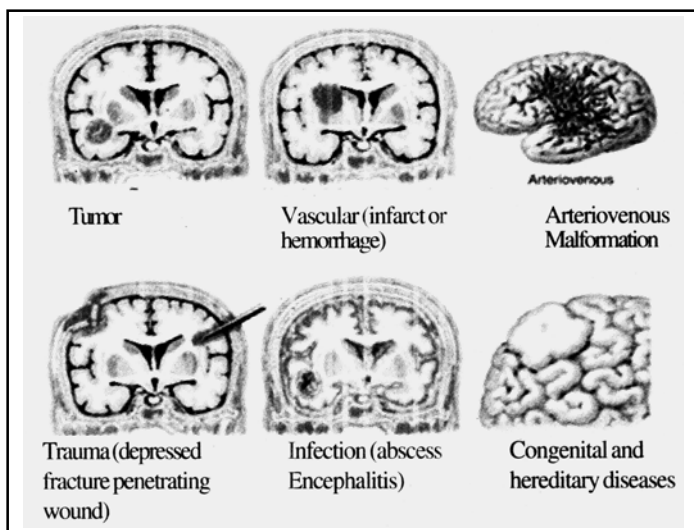




# 3

## COMA – UNCONSCIOUS STATE

Coma is derived from the Greek word meaning unconsciousness. Stupor, partial loss of consciousness, or long deep sleep, all these words signify varying state of the altered consciousness of the brain and body. In medical science, Coma is defined as a state in which the brain loses its alertness and the body stops responding to any inner or external stimuli and stops experiencing even the basic necessities. If this state continues for a long period of time or till death, the patient can be termed a Coma-patient. The fear psychosis that has been created by this word is not really justified as coma is not always so dangerous, but at the same time it is not to be taken too lightly either. Coma is a disease that can occur to anybody, anywhere. It is more common now, due to high blood pressure caused by the modern day lifestyle, habits and stress, diabetes, and road accidents etc.



**Causes :**

1. **Road Accidents:** Brain Trauma: Concussion, Contusion, Hemorrhage (Subdural, Epidural)
2. **Diseases related to blood circulation of the brain :** Thrombosis (clotting of blood in the vessels), Embolism, Hemorrhage, and Sub-arachnoid Hemorrhage.
3. **Infections of the brain:** Falciparum malaria, Meningitis, TB, Viral-Encephalitis, AIDS, and other opportunistic diseases like fungal; parasite infection, syphilis etc.
4. **Brain Tumor:** Cancerous tumors (primary or secondary) like Glioma or Metastasis, simple tumors like meningioma. In all these tumors, symptoms like headaches, vertigo, convulsions, vomiting, and paralysis of one or both the sides are seen. Differential diagnosis can be done on the basis of medical examination, CT scan and MRI.
5. **Metabolic diseases:** Diabetic coma is the commonest in these diseases. The tense lifestyle, mental stress, busy schedule etc. play a very important role in this. Oxygen deficiency, fluctuation in the blood sugar level, liver diseases, kidney diseases, respiratory disorders etc. cause debility in various organs of the body and eventually the efficiency of the brain is affected, causing coma.
6. **Nutritional deficiency** or dehydration can also lead to coma. Extreme deficiency of important elements like vitamin B<sub>1</sub>, B<sub>12</sub> etc. can also cause coma. Decrease in sodium level can also lead to coma, which is known as Hyponatremic Coma.
7. **Hormonal Imbalance:** Imbalance in the hormones of thyroid, parathyroid, adrenal, pituitary glands can also lead to coma.

8. **Epilepsy:** Epileptic attacks can also lead to coma.
9. **Alzheimer's Disease:** during the last stage of the disease one might lapse into coma.
10. **Poison:** Organophosphorous poisoning or heavy metals like arsenic or lead used for murder or suicide, overdose of sleeping pills, can also lead to coma.
11. **Drug Addiction.**
12. **Psychogenic Coma:** (the patient is not actually in coma)

The treatment of coma should be done systematically. Usually, the patient is thoroughly examined and his/her history, pulse, temperature, respiration are noted. The Nervous system and the eyes are also examined along with certain specific tests of the body and brain, which include various blood tests, MRI, CT scan, E.E.G. If necessary cerebrospinal fluid is also examined. These are very helpful for the treatment. Before a coma patient is considered brain dead, the brain death has to be ascertained very carefully and the rules and regulations made specifically for this purpose are to be followed before declaring it. In this situation, the brain never regains consciousness, so such a patient can donate his/her kidney and other parts to save the life of another patient before his/her heart stops functioning.

### **Treatment :**

The main points for the treatment of coma are as under:

1. According to the seriousness of the condition, the patient should be immediately given intensive treatment in an L.C.U.
2. Immediate treatment is initiated to normalise important functions like respiration, blood circulation, blood pressure.

3. If the cause is unknown, immediate glucose, vitamin B<sub>1</sub> and injection Nalorphine are administered as the first line of treatment:
4. The cause/causes of Coma are determined quickly by blood tests and if need be E.E.G, CT scan, lumbar puncture etc. are conducted and accordingly its treatment is started as soon as possible. For instance if there is an infection in the brain, an antibiotic, or TB medicine can be administered, or if there is thrombosis, the drugs to prevent the blood from clotting are to be administered.
5. If there is dehydration, intravenous administration of fluids is done; if there is an acid base imbalance, an intensive treatment is given. Nutritional imbalance is corrected by giving a diet with proper calories.
6. If the coma is due to the defect of any organ, its treatment is given or if the problem is due to diabetes or thyroid disorder, its immediate treatment is commenced.
7. Convulsions or deficiency of sodium etc. are also given immediate treatment with proper drugs.

There is a considerable difference between the two conditions leading to coma, i.e. structural and metabolic. Brain tumor, paralysis and brain hemorrhage caused by accident, are included in the structural causes, where the brain is attacked directly. Whereas in the metabolic coma, abnormality is first observed in other parts of the body rather than the brain. So the disease first starts in the body, which later affects the brain. There are about 2 to 8 % cases where the cause of the coma remains unknown.

### **General tips :**

An unexpected, severe or continuous headache should never be taken lightly and the doctor should be consulted immediately. A paralytic patient should be admitted to the hospital without wasting any time, so that necessary treatment is started immediately after CT scan etc. are done. The growing numbers of paralytic and coma patients can be controlled only if blood pressure, diabetes, obesity etc. are treated properly, and lifestyle is improved.

The reasons for increase in number of coma patients now-a-days are abuse of tobacco, alcohol, drugs, road accidents, poisoning, and increasing cases of AIDS. The side effects of some drugs can also lead to coma, e.g. excessive dose of insulin lowers blood sugar level below the acceptable limits leading to coma.

There is no way to know, when a patient will come out of coma. It is different in each case. Interestingly, many coma patients have narrated similar extraordinary experiences during their coma. A patient can once again relapse into coma, after coming out of it.

Along with the right treatment proper nourishment and care, love and prayers can also give miraculous results. The will-power of the patient, which remains strong even in the unconscious state and the doctor's loving care can also help the patient recover faster.

After remaining in a comatose state, for a considerable period when the patients recover, some may lose their speech or memory. Some may never come out of the coma and gradually slide towards brain death. In the cases of coma the average death rate is 10 to 20 percent.



# 4

## EPILEPSY

You must have seen some patient somewhere, having recurrent involuntary seizure or jerks, with or without impaired consciousness. This may be a case of Epilepsy: You would have noticed people attending to such persons in a very funny manner for observing curiously without helping the person correctly. This chapter deals with the problem: its causes, its correct approach and the myths associated with it. Epilepsy means frequently occurring convulsions or seizures. A single episode of convulsion cannot be called epilepsy. Epilepsy is a disease of the brain in which excessive electrical impulses are produced in the brain for a short period of time resulting in tremors or seizures. One in every hundred persons suffers from epilepsy and thus over 10 million people in our country are afflicted with this disease. According to a survey, 4 out of every 100 persons have suffered from a convulsion at least once in his lifetime e.g. convulsion during high fever. In 70 to 75% cases of epilepsy the disease is present from childhood. If timely treatment is not given, the patient may suffer from physical and mental damage in future.

**If an epileptic patient takes optimum treatment regularly then he/she 'can lead almost a normal life. 50% of the patients become seizure free permanently only after 2 to 3 years treatment.**

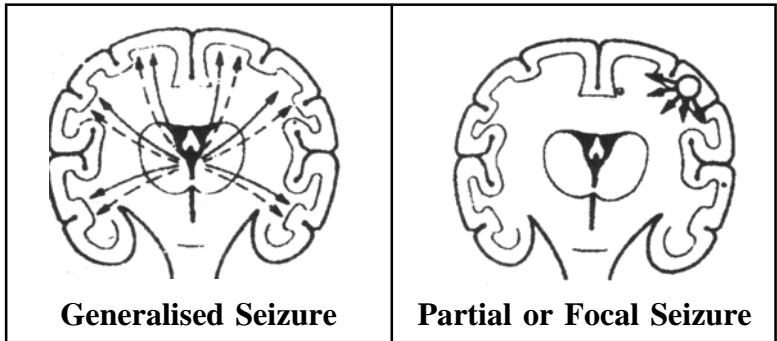
**The main causes of Epilepsy are as follows :**

1. Trauma during birth of the child or lack of oxygenation perinatally.
2. Road accidents or any other head injury.

3. Brain Tumor.
4. Decreased circulation in the brain.
5. Brain infections or fever of brain (e.g. brain TB).
6. Hereditary factors.
7. Hypoglycemia (reduced sugar).
8. None of the above known causes (e.g. idiopathic).

**There are three types of epilepsy :**

1. Generalized seizure.
2. Partial seizure.
3. Psychogenic-Hysteria.



**These three are further divided as follows :**

**1. Generalized Seizure :**

- A. Grandmal epilepsy or seizure of the entire body: In this type of epilepsy, loss of consciousness, screaming, frothing from the mouth, tremors, tongue biting may occur and sometimes urine and stool are also passed unconsciously. After regaining consciousness, the patient remains in a semiconscious state for some time or goes to sleep He may be paralyzed temporarily.

Sometimes a patient may get an inkling of the impending seizure, this is known as Aura.

- B. Petitmal: In this type of epilepsy the patient suddenly becomes momentarily blank, stunned and blacks out for a few moments.
- C. Myoclonic seizure: In these cases the person experiences sudden shock like momentary jerks in the limbs and the things held in hand may fall down, but there is no loss of consciousness.
- D. Besides these there are tonic-clonic and akinetic seizures, which are classified as Generalized seizures.

## **2. Partial Seizure:**

- A. Simple Partial Seizure: The patient remains conscious, but jerking or tingling is felt in one half side of the body.
- B. Complex Partial Seizure: If the patient loses momentary consciousness along with-<sup>\*</sup> the symptoms of simple partial seizure, it is known as complex partial seizure. In this type, the patient loses consciousness or behaves abnormally for a few moments and immediately becomes normal again.

## **3. Psychogenic Hysteria :**

Hysteria is a disease which resembles epilepsy. It is more common among women. This disease can be cured with proper treatment by a psychiatrist as well as by tackling the underlying socio - economic problem.

## **Febrile Convulsions :**

Sometimes during childhood convulsions may occur due to high fever, which tend to subside automatically after the



age of five years. But it is essential to ascertain that no damage has occurred to the brain by these convulsions. In children who get convulsions during fever, it is necessary to ascertain that they do not suffer from fever as far as possible. If fever does occur, Paracetamol or Nimesulide as well as Clobazam should be administered immediately. The medicine called Direc-2 or any other similar kind can be administered rectally if a convulsion seems imminent. It will not only prevent the convulsion, but will also check it midway. This drug can be administered every 12 hours. It is essential to prevent such seizures because frequent attacks can get converted into complex partial seizures or generalized seizures in future.

**The following points should be kept in mind during an epileptic attack :**

1. The patient should be made to lie on his side and clothes should be loosened. To prevent an injury to the tongue, a handkerchief or a gauze piece may be placed in the mouth, but one should not insert it forcibly.
2. If the patient is hurt or seizures occur repeatedly, it is necessary to take medical advice. If necessary, intravenous administration of Diazepam can be done or the patient may immediately be admitted to a hospital.

An epileptic can lead a normal healthy life, get married, and female patients can also conceive. During pregnancy certain medicines taken for epilepsy do not cause any substantial harm to the Foetus e.g. Carbamazepine. Actually if the drug is stopped and a seizure occurs, the harm to the Foetus due to the lack of oxygen is much greater. Therefore pregnant ladies need to take the medicine regularly. Newer antiepileptic drugs are considered safer in pregnancy.

### **Investigation of Epilepsy :**

A detailed description of the seizure should be made for the purpose of investigation. The minutest details of the seizure should be collected from the person who has .

witnessed the epileptic patient undergoing a seizure. This gives immense information about the type, speed and seriousness of disease to the doctor, apart from telling whether it was a seizure or hysteria or syncope or any other brief event. So interviewing the eye witness is indispensable whenever he or she is available. In order to gather further information about the type of seizure, line of treatment, etc. E.E.G., CT Scan or MRI may be necessary. Blood tests and plain X-Rays of the brain and the chest are also required.

### **Treatment of Epilepsy :**

After investigating the causes of the disease, planning proper treatment is essential. Any precipitating situations, which may aggravate the disease, should be avoided. Thus late nights, tension, fasting or excessive physical or mental stress should be avoided. Proper medication taken for a considerable period of time can definitely control the disease.

### **Main drugs (Conventional drugs) used for Epilepsy are:**

1. **Phenobarbitone:** (e.g. Gardenal, Beetal)
2. **Phenytoin:** (e.g. Dilantin, Eptoin)
3. **Carbamazepine :** (e.g. Zeptol, Tegrital, Carbatol, Zen, Mazetol)
4. **Valproate:** (e.g. Encorate, Valparin, Epilex)

As per the new technology, now slow release formulation drugs are available in Carbamazepine and Valproic acid e.g.

Tegrital - CR, Valtec - CR respectively. This helps to maintain adequate blood level all through out the day, by taking drugs only twice a day. The important side effects of antiepileptic drugs are discussed in chapter No. 23.

Depending on the symptoms and the type of epilepsy, the doctor decides the right drug. In the last few years many new researches have been conducted on this disease and new drugs have been developed for effective control of Epilepsy. The new researches can be classified in two major categories: surgery and medicines.

### **Newer Drugs :**

The second generation anti-epileptic drugs, now being used to treat patients not responding to conventional drugs include Gabapentin, Lamotrigine, Vigabatrine, Felbamate, Topiramate.

These drugs have been approved by the F.D.A. (Federal Drug Authority of USA). Though the newer drugs seem to have less side effects, fewer things require to be monitored (Viz. 2% patients on Topiramate develop kidney stone). Long term results of these drugs are not yet available, but they seem to be safe in pregnancy. Hence, there would be very little risk to the newborn. Therefore, in patients not improving or having side effects with main conventional drugs, newer drugs should definitely be tried.

### **Recently Introduced Drugs :**

These third generation drugs viz. Oxcarbazepine, Levitiracetam, Zonisamide have only recently been introduced and therefore, we have little experience with these drugs, but to date they have proved to be beneficial. Their side effects

are minimal and hence they are likely to replace easily the older drugs (e.g. Oxcarbazepine is likely to replace Carbamazepine).

### **Refractory Epilepsy :**

When the main antiepileptic drugs (AED) have been tried according to the guidelines - (including polytherapy) in optimum dose and for adequate time period and still if seizures cannot be controlled, the diagnosis of refractory seizures can be made. Before doing so we need to confirm certain things.

1. Confirm diagnosis - Is it Epilepsy? Syncope, Hysterical Fits, Hypoglycemic Spells etc. should be ruled out. The type of Epilepsy or any underlying cause should be evaluated.
2. Review treatment - Whether an appropriate drug has been given in appropriate dose. Sometimes an inappropriate drug may worsen seizures (eg. Carbamazepine aggravates myoclonic Epilepsy).
3. Assess whether the drug combination is right. Blood level of drugs need to be periodically checked. Finish EEG, CT Scan of the Brain, MRI of the Brain to look for any additional cause of refractoriness.
4. Check for patient compliance. Is the patient taking the drugs regularly? Is he on drugs for any other disease? Is there any brain tumor, birth defect etc. If needed, patient should undergo special investigations like video EEG, depth electrode EEG, SI'ECT, MRI.

If all these issues have been looked into and the relevant problems addressed, most of the seizures can be controlled.

However, if despite having tried two different drugs as mono therapy ( for at least 6 months each) and at least one (or two) combination therapy, patient has one/two fits every month for two years, then the patient is said to have refractory epilepsy. About 15 to 22% of all the patients of epilepsy, are thus having refractory epilepsy. However the diagnosis needs to be individualized taking into consideration the patient's age and his physical and mental condition and his social and financial background. For such patients the following steps can be taken.

1. **New drugs** can be tried as add-ons to the conventional drugs. Occasionally new drugs can be instituted as first line of treatment.
2. **Surgery** : When drugs fail to control seizures and the cause of seizures is an electrical focus which may be localized to a structure, then seizures can be controlled after appropriate surgery. During the last decade, there has been satisfactory progress in this field. Hence, in refractory cases where a focus can be defined as a cause of epilepsy, surgery can fully control seizures in 30 to 35 % patients. In another 30 to 35 % cases, seizures are fairly reduced after surgery. The facilities for these surgeries are available in our Country and they do not carry much risk. The cost of surgery comes to Rs. 50,000 to 2,00,000 approximately. A team of experienced Neurosurgeon - Neurophysician can decide as to which of the following surgeries would be beneficial to the patient.

(a) Resective Surgery    (b) Functional Surgery

**(a) Resective Surgery**

- (i) Microscopic Dissection
- (ii) Temporal Lobe Surgery
- (iii) Extra Temporal Surgery
- (iv) Lesionectomy
- (v) Lobectomy
- (vi) Multi Lobar Surgery
- (vii) Hemispherectomy

**(b) Functional- Nonresective Surgery**

- (i) Corpus Callosotomy
- (ii) Multiple Subpial Transection
- (iii) Stereotactic Procedure
- (iv) Ionising Radiation
- (v) Commissurotomy

**(c) Stimulation**

- (i) Vagus Nerve Stimulation
- (ii) Thalamic Stimulation
- (iii) Cerebellar Stimulation Vagus Nerve Stimulation :

In 1980 Joseph zarbara proposed this therapy. This surgical procedure costing about Rs.8-10 lacs entails stimulation of vagus nerve with a computerized system. This can reduce the frequency of seizures to less than 50%. One can continue anti-epileptic drugs with this therapy. If a patient has aura, he can stimulate the electrode and abort the oncoming fit. This is a safe and hence increasingly popular mode of treatment. The parameters can be changed: For those patients who are not appropriate candidates for surgery, in whom a focus is not dependable or those who are awaiting surgery this method is beneficial, specially when anti-epileptic drugs have not worked.

### **Ketogenic Diet :**

This mode of treatment came into vogue after the observation that substituting 80% fat in diet significantly reduces the frequency of seizures. This mode of treatment may help in the cases of refractory seizures. About 30% children have improved after this treatment. This form of treatment may sound difficult for children initially but slowly they adapt to this diet. This should be continued for 1 to 2 years under supervision. Parents also have an important role to play and this therapy is not expensive. Initiation of this form of treatment may be done in hospital.

It is beyond doubt that the novel approaches (eg. Targeted drug delivery), newer surgical techniques will ensure brighter future for epileptic patients. **Since Epilepsy is a very common disease**, I have dealt with the topic at length. However in view of the ever changing concepts and advances in the field of medicine, this discussion should be adequate; if not complete.

### **Misconceptions :**

Unfortunately a lot of misconceptions are still prevailing about Epilepsy; therefore it has been observed that the patients do not get the correct treatment.

1. **“Epilepsy is a mental disease.” This is not true.**
2. **“During seizure attack, an iron piece should be put in his palm or he should be made to smell an onion or a shoe”.** All these beliefs are misconceptions. Actually the seizure usually subsides automatically within 1 to 5 minutes.

3. **“Epilepsy is a hereditary disease.”** Epilepsy is not a hereditary disease, but if any of the parents is suffering from epilepsy, the possibilities of the offspring having epilepsy are slightly higher.
4. **“Vitamins or Tonics are good for patients suffering from epilepsy”.** This is another misconception.
5. **“Once an epileptic always an epileptic”.** This is not true. 60 to 75% patients are cured completely with the help of proper medication. It may so happen that a person gets a seizure only once in a lifetime.

**Even after recovering from epilepsy it is advisable to stay away from fire and not drive or swim for some years.**

**Epileptic patients should be considered as normal; one should not have a biased attitude towards them. They should not be considered handicapped.**

Julius Cesar, Napoleon, Alfred Nobel, Vincent Van Gaugh, Jhonty Rhodes, and many other great personalities suffered from epilepsy, but still managed to excel in their respective professions. Thus, epilepsy is not a barrier to excellence in social life or business activities.

To help the epileptic patients “The Indian **Epilepsy Association and Society**” have been very active in several cities. They provide detailed information on epilepsy and also arrange various group programmes. Various activities are carried out to provide moral support to the patient and family members, and to help patients gain acceptance in the society. Society should support such noble activities.





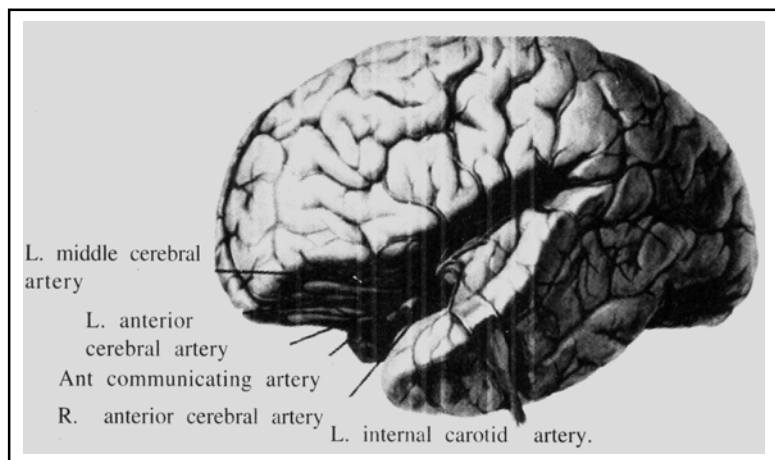
# 5

## PARALYSIS – STROKE

Stroke is a very common disease in our country. Stroke is the major cause of death after heart attack, cancer and road accidents. It is really sad and surprising that there is very little awareness among the general public regarding this disease.

Like heart attack, knowledge of the risk factors can prevent the occurrence of the disease in majority of cases. If the warning signs are identified in time, immediate safety measures can be taken easily, so that in future any major stroke can be averted. After a stroke it is essential that immediate diagnosis and correct treatment be given to prevent permanent disabilities. This will be beneficial socially, personally, financially, family wise and nationally. This is the main aim behind providing detailed information of paralysis (brain stroke) in this chapter.

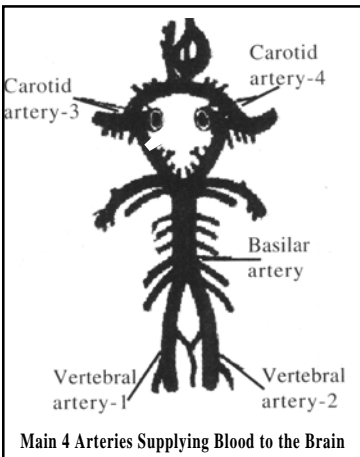
**Paralysis can occur due to obstruction in the blood circulation in the main arteries supplying blood to the brain.**



The high fat and sweet diet pattern, sedentary lifestyle, lack of exercise, excessive fat deposition on the abdominal area, hereditary (racial) causes, excessive lipids in the blood ..... all these are the reasons why Indians and among them particularly the people of Guj arat are more susceptible to heart attacks and stroke.

**Stroke means** sudden paralysis of the right or left side of the body. During stroke, sometimes the ability of speech, comprehension and/or sight can also get affected. Due to the obstruction of some of the arteries of the brain, the blood circulation is affected leading to reduced nutrition and oxygen to brain cells, which hampers the normal working of these brain cells leading to a stroke.

Some fortunate people get a transient paralytic attack, which is completely cured within 24 hours. In medical terminology this is known as TIA (Transient Ischemic Attack). In 30% of these kind of patients there is a possibility of getting a bigger stroke attack in next five years. Thus, this serves as a warning for such patients to take good care of themselves in order to avoid future strokes.



Main 4 Arteries Supplying Blood to the Brain

The doctors evaluate the extent, type and location of the damage to the brain on the basis of the signs and the severity of the paralytic attack. If the left side of the brain is affected then the right side of the body is paralyzed, and usually speech is also affected. Similarly, if the right side of the brain is affected, the left side of the body gets paralyzed.

The brain receives blood from four major arteries. The two arteries in the anterior portion of the neck are called the Carotid arteries and the arteries in the posterior part of the neck are called the vertebral arteries, which provide uninterrupted blood supply to the brain. The posterior arteries then merge to form the Basilar artery, which is one of the most important arteries of our body.

If there is a constriction or obstruction in the main artery supplying blood to the brain due to a clot, the circulation of blood in the brain is hampered. If the heart stops beating for some minutes, then the brain suffers damage. Sometimes thrombosis of blood in the veins can also cause paralysis.

With advancing age the inner lining of the damaged arteries thickens causing an obstruction or reduction in the blood flow. Such a condition is known as Arteriosclerosis.

Thus cells of the brain can be damaged in two ways. Increase of lipids in the blood can cause thickening of blood and a local clot formed resulting in **Thrombosis**, or a clot from the heart or any other part of the body may travel to the arteries of the brain, obstructing blood supply to the brain. This is known as **Embolism**. In 20% of the cases rupture of a blood vessel due to high blood pressure or any other reason, causes paralysis. This condition is called Brain Hemorrhage.

Symptoms similar to stroke can also occur in other diseases like infections of brain, brain tumor, lymphomas, multiple sclerosis, hysteria, head injuries etc...In these cases there may be paralysis of one or both sides. This paralysis is different from stroke and other associated symptoms can usually help in differential diagnosis.

**Risk factors responsible for occurrence of a stroke are as under :**

1. High blood pressure
2. Diabetes
3. High lipids (fats) in the blood
4. Obesity (excess weight)
5. Smoking, tobacco or alcohol abuse
6. Heart disease (IHD), diseases of the valve, irregular pulse (AF)
7. Previous stroke or T.I.A
8. Use of Contraceptive pills
9. Hectic lifestyle, stress or sedentary life and lack of exercise
10. Genetic causes
11. Diseases of the blood that result in clotting or increased viscosity of the blood
12. Diseases like collagen disease, anticardiolipin syndrome
13. Metabolic diseases like Homocysteinuria, and
14. Addiction to cocaine and other drugs.

Many of the above mentioned risk factors are common to heart disease and stroke. These factors can be effectively controlled by regular treatment and preventive measures.

People beyond the age of 40, need regular medical examinations. If any of the family member has suffered from a heart disease or a stroke, it is necessary for the other members to take extra precautions.

There are some of less-known but potential factors, which may cause a stroke. Presence of infectious disease in the body, electrolyte imbalance (Sodium-Potassium), low

hemoglobin levels, environment, hardness of water etc... may be some of the reasons for stroke, but they are not yet accepted universally.

It should also be noted that 40% of the patients of stroke have no apparent and visible risk factors worth accounting for the stroke.

**The warning signals of an impending stroke (T.I.A.) :**

1. Feeling of weakness in one side of the body; the limbs of the affected side may stop working or become numb.
2. Momentary loss of vision in one or both the eyes.
3. Confusion, difficulty in speech or comprehension, for a short period of time.
4. Vertigo, blurring of vision, diplopia, sudden headaches, nausea or vomiting, weakness in both the legs, stumbling, sudden momentary unconsciousness or falling down. These symptoms prevail for certain period of time and if the symptoms are ignored and if no treatment is commenced, paralysis of a whole side ensues, with loss of speech and the patient may be unconscious. Ignoring these symptoms can prove fatal.

**Prevention of a stroke :**

1. Arteriosclerosis develops gradually and is a slowly progressive disease. The above mentioned risk factors can increase the speed and extent of damage. This can cause a lot of damage. In order to avoid this, obesity should be prevented by taking a proper nutritious diet. Tobacco and smoking should be stopped.
2. Blood Pressure: Blood pressure should be regularly checked and if it is high, proper medication should be taken to keep it under control. Even a normal person should

intermittently monitor one's blood pressure, especially if symptoms like headache, dizziness, vertigo, and anxiety occur. Even if a patient has come for any other disease or ailment, according to a notification of the National Stroke Association, it is the duty of the doctor to check the patient's blood pressure. Regular check-up of blood pressure will prevent heart disease, paralysis and kidney diseases. Ideally, systolic blood pressure should be around 130 to 140 while the diastolic blood pressure should be maintained at 80 to 90. Time and again it has been proved that by merely controlling blood pressure alone, 40 to 50% cases of paralysis and heart diseases can be prevented. Thus regulation of blood pressure is of utmost importance. There are a lot of misconceptions about blood pressure in common people. There are many people who are not ready to accept that they are suffering from high blood pressure because they do not get any symptoms like headache or dizziness. But they don't understand that all patients of high blood pressure do not have these symptoms. Some patients take medications for some time and feel that their blood pressure is cured. Whenever the blood pressure is measured while taking the medication, it is bound to be normal and therefore the patient may discontinue the medication due to a false sense of security. This can prove very dangerous. On discontinuing the drugs, blood pressure starts increasing again, eventually resulting in paralysis or heart attack. This has been observed frequently and is a sad occurrence.

3. **Diabetes:** Just like blood pressure, diabetes is also a very dangerous condition. It is a silent disease, which quietly causes a lot of damage. It is essential, that one

accepts the disease and takes regular necessary . treatment. Blood sugar should be checked regularly. Along with the right treatment, the patient should be careful about his lifestyle as well as eating habits. Exercise is essential for a diabetic patient.

4. **Diet:** To prevent a stroke, the fat content in the diet should be reduced to bare minimum. Ghee, butter, fried snacks and ice cream should be taken in moderation. In India, particularly in Gujarat consumption of ice cream is the highest. Instead, salads, fresh fruits and vegetables should be consumed in larger quantity.
5. **Regular Aerobic Exercise:** 45 to .60 minutes of walking or other aerobic exercise daily can be very beneficial. Yoga and other appropriate exercises can also be carried out regularly. It is necessary to do exercise for at least 5 days in a week.
6. **Tensions and stress should** be reduced and one should learn to relax and enjoy life. Jealousy, anger, negative thinking should be avoided and everyone should live in harmony, which will always be beneficial.
7. **Use of contraceptive pills** should be reduced to bare minimum and other forms of contraception should be followed.
8. The patients who have previously suffered a stroke or a heart attack should take drugs like **Aspirin**, Dipyridamol, Ticlopidine, Clopidogrel, etc; to keep the blood thin, as per prescription from the doctor. With the help of these drugs the chances of a heart attack or paralysis can be reduced by about 13% to 45%. This is secondary prevention. But there is a difference of opinion as regards

the primary prevention. If a patient has not suffered either a heart attack or a brain attack, but has definite risk factors e.g. advanced age, diabetes, high blood pressure, this patient should take aspirin or not ? Well, if risk factors are more it is logical to take Aspirin..

9. If there is elevated Lipid level particularly Cholesterol or LDL levels and if HDL Cholesterol level is low, then these patients benefit immensely with regular supervised doses of statin group of drugs viz. Atorvastatin, Lovastatin, Simvastatin, Pravastatin. This recent scientific invention has revolutionized the concept of treatment of heart attacks and paralysis and has averted several angioplasties, coronary bypass surgeries and perhaps carotid surgeries.

### **Diagnosis :**

Paralysis is a disease of the brain and therefore it is necessary to get proper and timely treatment from an experienced Physician or a Neurophysician. In order to locate the lesion and the extent of damage these doctors conduct necessary Physical examinations and use related diagnostic tools like a CT scan or MRI for proper diagnosis and decision of the appropriate line of treatment. It is advisable to get a CT scan done in the initial few hours of a stroke, in order to find out whether the patient is suffering from a hemorrhage or thromboembolism. Hemorrhage can readily be detected in a CT scan very easily. In the cases of thrombosis, CT scan is normal in the first few hours. Therefore, in cases of paralysis if the CT scan does not show a hemorrhage, then usually, immediate treatment for thrombosis is started. Another CT scan done after 24 to 36 hours, with a contrast dye confirms thrombosis along with the extent of damage. With the help of this, one can predict the future of



the patient. Sometimes there can be another disease with similar symptoms and a scan will diagnose the same, preventing a fatal mistake e.g. Tumor, abscess.

In addition to this, hematological tests, biochemistry (sugar, tests related to kidney etc.), E.C.G. and other important tests are also done to assess the physical condition of the patient. Lipid profiles are done regularly. For the assessment of heart diseases 2D Echo test can also be done.

As observed earlier the risk factors of stroke as well as heart diseases are the same and heart disease is comparatively more prevalent than stroke. Therefore, investigations relating to heart disease are essential in patients of paralysis to prevent heart disease. According to a scientific research, number of paralytic patients dying due to heart disease is far more than the deaths caused by stroke.

For young patients of paralysis, who do not have blood pressure or diabetes, special investigations like anticardiolipin test, homocysteine tests etc. are advisable.

The damage to the blood vessels can be ascertained by Carotid Vertebral Doppler or MR angiography (or DSA Angiography). The decision of the investigations required for the patient, is better left to the doctor.

### **Details of the treatment of stroke :**

As soon as the symptoms of stroke or paralysis are seen, immediate treatment should be started in a hospital by an expert physician or a neurologist. **Delay can be dangerous.** If possible, while taking the patient to the intensive care unit, the CT scan should be done on the way, if the facility is available in that city. If the patient is very serious he should be admitted immediately in an ICU (intensive care unit).

If the patient is serious and also has edema of the brain along with paralysis, emergency treatment should be initiated in ICU or even at home to prevent him from going into coma. The doctor should ensure that BP, pulse and respiration are maintained at normal levels. If the patient gets a convulsion, it should be immediately brought under control and if he is suffering from blood pressure, diabetes etc then they should also be controlled immediately. In short every minute counts.

### **Treatment of Paralysis : Six Major Aspects**

1. Thrombolytic therapy.
2. Antithrombic therapy.
3. Neuroprotective therapy.
4. Therapy for complications.
5. Neurosurgery.
6. Supportive therapy: Physiotherapy, etc.



**Thrombosis - Clotting of Blood**

## 1. **Thrombolytic therapy :**

It is an undisputed fact that in case of thromboembolism, if immediate treatment is given with latest special techniques, in the first 3 to 6 hours of paralysis, then in many cases

- a) entire blocked artery opens up;
- b) the clot in the artery (thrombus) melts;
- c) the damage to the brain cells can be prevented or reduced.

Thus incipient paralysis as well as its complications can be prevented. Major research has been conducted on Thrombolytic therapy in which a drug called rt-PA is given through intravenous or intraarterial route within 1 to 3 or 1 to 6 hours. Several other similar drugs are under research e.g. Prourokinase, Urokinase. The results are really very good, but this therapy requires a fully equipped hospital having special equipment and facilities (CT scan, Angiography etc.). These treatments are moderately expensive, costing about Rs.60,000 to Rs.90,000. In addition, 4 to 7 % of the patients suffer from brain hemorrhage as a side effect. But in effect the death rate does not increase due to this side effect. Considering all the options, this is still the best available recent therapy. It is the only treatment approved by FDA for acute stroke treatment in USA. In foreign countries public awareness about stroke is very high and hence the person suffering from one is immediately taken to a hospital within 1 to 2 hours. Due to the availability of the coverage of the stroke therapy through insurance policy abroad, particularly USA, this therapy is extensively used. We hope that the same happens in India too and the attitude of the people towards insurance changes for the better.

Because of constraints, only time will tell whether this therapy will reach the common man and give desired results. Though our doctors are well aware of this therapy, there are many practical problems in our country. The other therapies available till now cannot cure paralysis beyond six hours after the stroke, as they can not rejuvenate the brain cells, which have died due to lack of blood and oxygen.

## **2. Antithrombotic therapy :**

This therapy is easily available in our country and it aims to stop the clot formation in the blood vessels. It includes anticoagulant drugs like, heparin, low molecular heparin, drugs of antiplatelet group, like aspirin, dipyridamol, abciximab and drugs of fibrinolytic group, like ancred. Their use, checks further damage. However, they can lead to side effects like hemorrhage and therefore they need to be administered in the right dose with proper investigations. Ticlopidine, Clopidogrel etc. may not be very effective in the initial stages of paralysis but they are successful in preventing future paralytic attacks.

About 10% to 15% of patients suffer from a strange situation called stroke-in-evolution. It is called strange because even after taking the necessary medications after the initial symptoms of stroke, the paralysis keeps on advancing for 2 to 4 days and eventually the entire side is completely paralyzed. This situation arises when the clot is obstructing the blood vessel gradually and the antithrombotic or antiplatelet drugs are not sufficient enough to offer complete protection against the disease. This can create a

misunderstanding between the patient and the doctor, as condition of the patient worsens in spite of the treatment. So patients should be informed about this possibility from the beginning of treatment. If the paralysis is advancing, a second CT scan should be done to rule out hemorrhage.

In the case of thrombosis, during the initial days the blood pressure should not be brought down rapidly, because this causes a decrease in the blood supply of the brain increasing paralysis further. The neurologists usually do not give any drug to reduce blood pressure (In the first 7 days of a paralysis related to thrombosis) if the systolic B.P. is around 200 and the diastolic is around 110 (except in a fresh case of heart attack or angina or any other specific reason).

### **3. Neuroprotective Drugs :**

In cases of stroke, theoretically during the first 6 to 24 hours, chemicals should be given which provide nutrition and oxygen to the cells for a longer period, remove metabolic disturbances, protect the cell walls, and prevent the cells from breaking and dying (due to lack of blood and oxygen). There are about 30 to 40 types of drugs for this purpose (Nimodipine, Citicholine, Piracetam, MK-801), which have undergone various laboratory trials. But for reasons unknown, it has been seen that when they are administered to the patients, they do not give the expected results. There are some scientific reasons also for this failure and so better drugs are being developed which can prevent cell damage and keep the cells intact and alive for a longer period even if there is a deficiency of blood and oxygen.

#### **4. Treatment of Complications :**

During paralysis there can be various complications which increase the severity of the disease like swelling in the brain, unconsciousness, seizures, fever, pneumonia, increase or decrease of the water proportion in the body, bloating of the stomach, retention of urine and fluctuations in the levels of sodium or potassium. The doctor should constantly monitor the condition of the patient minutely so that the patient gets well soon. If a patient gets respiratory distress or goes into a coma due to excessive edema of brain, the patient should be kept on a ventilator and his/her life can be saved.

#### **5. Neurosurgery :**

In certain cases (2 to 5%) of paralysis, one may require the help of a neurosurgeon who may be able to save the life of a patient and reduce the damage of the brain cells by emergency operations like craniotomy-duraplasty, emergency carotid bypass and embolectomy etc. In a stroke due to hemorrhage, sometimes the skull is opened and the clots are removed (if the drugs are unable to improve the patient's condition and if it is possible to remove the clot).

#### **6. Supportive Therapy :**

Along with the treatment, it is essential that the patient gets proper nutrition and fluids along with vitamin supplements. If necessary, antibiotics can be administered. All these are included in supportive treatment.

Within 1 to 2 days of a stroke the doctor usually consults a physiotherapist, who makes the patient undergo limb and chest (respiration) exercises. Physiotherapy is recommended for at least 20 to 40 minutes, 4 to 6 times daily. It is imperative for the relatives of the patient to learn

these exercises and help the patient with them. The exercise provides various benefits to the patient. Basically this helps in preventing the stiffness and improves the movement of the limbs. It also prevents congestion of the chest due to cough, hence prevents pneumonia.

In order to prevent the recurrence of stroke, drugs of antiplatelet group like aspirin, dipyridamole, ticlopidine, clopidogrel, etc. are given for a long period of time. The doctor decides the right drug/drugs, their dosage etc. according to the condition of the patient and the possibility of recurrence of the disease. In some cases oral anti-coagulant drugs like, warfarin, acetrom etc. (which require meticulous monitoring and are risky) are also prescribed.

Ultra Sound Technique Doppler is used to examine the blood vessels (carotid and vertebral artery) situated in the neck, and if Carotid artery shows 60 to 70 % block then it is advisable to consult a neurosurgeon or a vascular surgeon who can remove the obstruction by surgical treatment. The surgery called Carotid Endarterectomy is not yet as popular in our country. It is increasingly becoming popular and its results are also good. The risk of surgery is not more than 1 to 2%. As angioplasty is being done instead of bypass surgery of the heart, similarly carotid angioplasty is gradually reducing the necessity of Endarterectomy.

Thus the combination of drugs, surgery, physiotherapy and treatment of the causes of stroke (like blood pressure, diabetes) can treat stroke permanently. The treatment can be said to be **successful** only if **the patient is rehabilitated physically, mentally, socially, financially and professionally.**

It is responsibility of a doctor not only to treat the patient, but also guide him about the various aspects of health and also explain the various warning symptoms (T.I.A),, risk factors, first aid, importance of immediate treatment etc. The role of a family doctor is vital in every case of paralysis.

At the same time the patient should make changes in his/ her life style. He/She should avoid sedentary life and do exercise regularly. The patient should follow the advice of the doctor and take medicines regularly, lead a simple life without any stress and make positive changes in his attitude:

A disciplined life, mental soundness, moderate exertion, regular exercise as well as yoga and the necessary medicines along with regulation of blood pressure and diabetes, can largely avoid stroke (and heart diseases too). Public awareness is very much necessary. This can prevent the damage (of various kinds) to a person, family, society as well as the country, to a great extent.

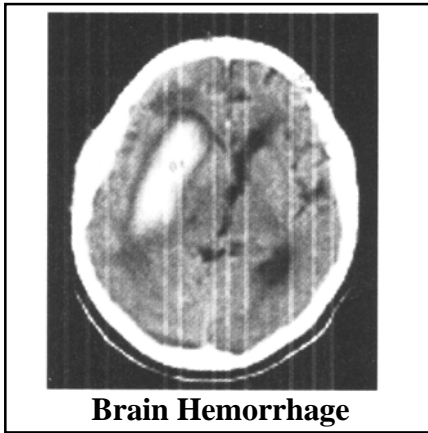




# 6

## BRAIN HEMORRHAGE

Brain Hemorrhage is a more serious type of brain attack and accounts for 20% of the cases of strokes occurring due to the faults in blood vessels. The remaining occur due to thromboembolism. This is a serious disease of the brain in which there is bleeding in the brain either due to the rupture of a blood vessel or some other reason. Most of the patients become unconscious in minutes and if timely treatment is not given, it proves fatal for many patients.



- **Brain hemorrhage can be classified into two groups:**
  1. **Intracerebral Hemorrhage:** Occurs due to either high blood pressure or because of the accumulation of a substance called Amyloid (Amyloid Angiopathy) in the blood vessel.
  2. **Subarachnoid Hemorrhage:** an unnatural swelling on the blood vessel (saccular aneurysm), or formation of an entangled mass of abnormal blood vessels (AN. Malformation) might rupture and cause hemorrhage.

In addition to these, side effects of anticoagulant type of medicines, head injuries, disorders of coagulation, infection in the brain, rupture of cancerous tumors can also cause brain hemorrhage.

### **1. Intra Cerebral Hemorrhage :**

Rupture of blood vessels deep inside the brain due to high blood pressure is called intracerebral hemorrhage. This hemorrhage occurs at some particular locations in the brain (like Putamen, Thalamus, Cerebellum) and usually while examining the patient; the physician can easily identify the location, by its specific signs and symptoms.

Amyloid Angiopathy is a kind of cerebral hemorrhage occurring mostly in elderly people and it can recur frequently.

If all these hemorrhages are diagnosed quickly and immediate treatment is initiated to reduce the edema of the brain and control of blood pressure, the death rate in the cases of cerebral hemorrhage can be brought down considerably. At present the death rate is as high as 50% to 60%. In some cases of cerebellar hemorrhage, e.g. temporal lobe hemorrhage or putaminal hemorrhage, lives can be saved by surgery done by a neurosurgeon. The goal of reducing death rate due to cerebral hemorrhage can be achieved by factors like awareness about the disease, quick diagnosis, treatment at a war footing, expert and quick decision making physicians and neurosurgeons and hospitals with all amenities like ventilator machine, operation theatre etc.

**Symptoms :**

Sudden headache, vomiting, vertigo, blackouts (these can be due to high blood pressure also), seizures, stumbling, paralysis, and loss of consciousness within a few minutes with rapid breathing; are the usual symptoms of brain hemorrhage.

**Diagnosis and emergency treatment :**

It is essential to get an immediate diagnosis with a CT scan or MRI scan. These tests can also identify the location of the hemorrhage, the size of the clot, edema of the brain and the cause of the same. It is better to get a CT scan done even before admission, if the facility is available in the city or town, provided the patient is stable with normal respiration and B.P.. This is for confirmation of the hemorrhage. Even if clinically, a hemorrhage is suspected, the scan some times may reveal a thrombosis, tumor, subdural or cerebral infection' and that would make a major difference in the line of treatment. However, emergency treatment in a hospital should be given immediately and the scan may be done later if the condition of the patient is serious.

It is essential to create awareness in the public that in any serious neurological condition, instead of wasting time by insisting on a home visit by the specialist, it is advisable to immediately call the family doctor and rush the patient to the hospital with an ambulance and if required get a scan done before admission. If the specialist doctor can visit immediately, it would be excellent. But usually it may take 2 to 4 hours for him to be available, during which precious time is lost and the delay in treatment may cause irreparable damage to the brain. If the family doctor also is unable to make it on time,

then the best option would be to take the patient immediately to the emergency ward of a good hospital and arrange for the specialist to reach there. Such a detailed explanation has basically been given on this subject because in majority of the cases exactly the opposite is seen to be happening and it leads to immense regret. Emergency medicine and, critical care is a separate and extremely important aspect of the medical fraternity. Here every second counts and critical decisions taken by the specialized doctors, who are well trained to save lives, play a very important role. Therefore, in this matter no social arguments or interference should be entertained.

In a case of hemorrhage, if blood pressure is found high by the family physician, immediate treatment for controlling the blood pressure is given. If there is an indication of thrombosis, then the blood pressure should not be abruptly brought down as it can cause a lot of damage. But if the blood pressure is very high or the patient is suffering from heart disease, or the patient is on anticoagulant therapy, it becomes very essential to lower the blood pressure to normal level even in case of thrombosis.

If the edema of the brain seems substantial, then emergency injections (mannitol, lasix) can be given by the family physician at home, before transferring the patient to the hospital. If the patient is getting seizures, then one should not wait, but start urgent treatment at home.

Sometimes lumbar puncture could be useful apart from CT scan, in the diagnostic process, but as mentioned later in the chapter on brain tumors, lumbar puncture is to be avoided if there is edema in the brain. Here it may prove dangerous.

Naturally, these patients are kept in ICU. They are monitored very intensively along with emergency treatment: If required angiography is performed and in selected cases surgery is done to aspirate blood.

If the cause of the hemorrhage is a deficiency of any of the blood clotting factors, the deficiency is corrected by transfusion of those factors. If the hemorrhage has occurred due to the side effects of any drug (like Warf, Acetrom which are given in cases of valvular defects) then plasma and other appropriate blood components are transfused to stop hemorrhage. In the medical profession hemorrhage is one of the most serious side effects of these drugs. The drugs, which prevent the clotting of the blood, can cause hemorrhage due to overdose in some cases. Therefore, it is very important to inform the patient in detail about the side effects of the medicine. Every 7 to 15 days Prothrombin time APTT/INR blood test has to be carried out regularly to monitor the thinning of the blood. If proper precautions are taken, no side effects occur and the patients lead a complication free life for years at a stretch. Just as insulin is extremely beneficial for a diabetic patient to lead a normal life, but an unrequired higher dose may cause hypoglycemia and even death. Same holds true for anticoagulant drugs.

Thus regulation of blood pressure, medicines for the edema of the brain, proper nursing, treatment of complications, and if required surgery can save the patients of intra cerebral hemorrhage to a large extent. If the patient is saved but paralysis persists as a consequence of the hemorrhage, physiotherapy along with drugs should be used for a long

period of time to activate the paralyzed limbs once again. It is a fact that the initial chances of death are much higher in hemorrhage than in thrombosis, but so is also a fact that recovery from paralysis due to hemorrhage is much better than in thrombosis. For care of sick patients, certain guidelines are given in chapter 24, which may be followed strictly by the care taker.

## **2. Subarachnoid Hemorrhage :**

This type of hemorrhage is completely different from the one discussed before. Most of these patients do not suffer from high blood pressure. Many of them are young and in most of them there is a congenital weakness in the blood vessels causing ballooning of the blood vessel (Saccular aneurysm) or entanglement of the vessels (AN. Malformation). These which rupture at a particular age due to sudden exertion or unknown causes, with oozing of blood into the subarachnoid spaces between the membranes of the brain. This is known as the subarachnoid hemorrhage. It is worth noting that out of every 100 people, at least one may be harboring such a congenital aneurysm in the blood vessels of the brain, but it can never be predicted when it may rupture and in many cases it may not rupture during the entire course of life.

Once it ruptures, nearly 45% to 60% patients die within a month. This disease is extremely dangerous and hence it is not only important to understand the disease but also have its early diagnosis before it ruptures. It is surprising that many patients may suddenly suffer from hemorrhage without any warning symptoms. However according to a group of

specialists, if there is a migraine like headache, strictly only on one side of the brain (like right side, above the ear, behind the eyes), which does not shift to the other side, and recurs frequently, an MR angiography of the brain should be done as a precautionary measure. This test can detect aneurysms of the blood vessels of the brain with an accuracy of 95 to 98%, without any invasive procedure. The cost of this test is about Rs.4000 to 6000/- but whether this test should be done in all such cases is debatable. But in my personal opinion and experience, in migraines, which constantly affect only one particular side of the brain, it is better to get this test done, to exclude aneurysm or A Vmalformation.

**The main symptoms of this disease** i.e. subarachnoid hemorrhage are that the patient experiences a never-before kind of severe headache, sometimes accompanied by a seizure and he might even become unconscious momentarily due to the edema in the brain. Usually the patient regains consciousness in a short while, but may again start losing consciousness after some time, suffer from paralysis and there may be irregularities in the vital functions like respiration, blood pressure or heart. Many such patients die immediately or within 14 to 30 days. Therefore, if the patient feels that he/she has never experienced such a splitting headache before along with other signs and symptoms, it is all the more important for the patient to see a neurologist so that timely treatment may save his / her life.

### **Investigation of Blood Vessels of the Brain :**

The test known as Angiography is the most important test. MR Angiography makes the use of the MRI magnet

for the examination of the blood vessels. In this test no catheter is required to be introduced in the blood vessels. Therefore, it is called a Non Invasive test. For coronary angiography, a catheter has to be introduced in a blood vessel and therefore there is a slight risk involved, which is not the case in a MR Angiography. This test can give an accuracy of only 90 to 95% and therefore, can be used only as a screening test. The gold standard tests are the conventional 4 vessel angiography or Digital Substraction Angiography (DSA). An aneurysm is immediately detected on angiography. In 15% cases more than one aneurysm can be present and so it is imperative that the angiography is done on all the four blood vessels of the brain, so that if surgery becomes necessary it can be planned keeping all the aneurysms in mind.

The angiography can also detect another vascular condition, i:e the entanglement of blood vessels known as arteriovenous malformation (AN. Malformation). These patients have a history of severe headache; with an occasional seizure, and some of them may.. already be suffering from the paralysis of a limb.

In some cases of sub-arachnoid hemorrhage DSA angiography may show normal results. Out of these cases a few may have a very small aneurysm or a cryptic AN. malformation or a vasospasm, which may not be detected on angiography. Therefore in such cases angiography is repeated after 3 months. Only then it can be confirmed that these are not the causes of hemorrhage. This kind of hemorrhage is termed as Idiopathic Sub-arachnoid Hemorrhage.



## **Complications :**

In this disease, there is a definite risk of rebleeding due to rerupture of the aneurysm, any time in the next month. Usually this is fatal or very serious. Similarly, between 4 to 12 days of primary bleeding, there is a spasm in the vessel distal to aneurysm - so called vasospasm. This is the cause of delayed paralysis and morbidity. This can be largely prevented with the help of drugs and hydration. Further, salt depletion and seizures are also nons known complications.

So, once the diagnosis is confirmed, in appropriate cases the aneurysm is clipped by surgery. It is either covered by a tissue or a plastic coating is done. Sometimes the Carotid artery in the neck is tied for the treatment. In the cases of large aneurysms, treatment is also done with the help of balloon.

For treating AV Malformation, Block resection or Ligation Technique is used or it can be cauterized by a proton beam. Now-a-days gamma knife is more frequently used where gamma rays generated from a cobalt source are focused by a gamma knife and the cauterization is done with precision.

In those cases where surgery is not possible, embolisation is carried out by platinum foil. This technique can be used both in aneurysm as well as in AV Malformation. Luckily, all these surgical techniques and procedures are available in major cities in India and hence the mortality and morbidity are reduced very significantly.



# 7

## MIGRAINE, HEADACHES AND VERTIGO

Headache is the most common disease of the brain. It is said that everyone suffers from a headache at least once in his or her life while some suffer from it frequently. Headache is a common symptom but it can be serious in some cases. In 1 % patients the cause may be a brain tumor. Some people may complain of a unilateral headache, which occurs every few days or months and can be migraine.

If the headache is of recent origin, then changes in daily lifestyle such as the pattern of working, eating habits or sleeping habits may also be a cause. If the headache has been there for some months then it has to be noted what prompted the patient to seek treatment. Contraceptive pills can also cause headache in some women. High blood pressure can also be one of the reasons for headache. Thus, it is very necessary for patients with headache, to undergo complete history, neurological and physical check-up and investigations. Along with headache, if the person has loss of consciousness, double vision, seizures, vertigo, or blackouts then it warrants urgent CT Scan, so as to rule out a brain tumor or an ordinary edema.

The various alarming diseases, which could cause headache, are meningitis, brain hemorrhage, brain tumor, arteritis, edema of the brain and impaired blood circulation in the brain. Luckily very few patients with headache may be suffering from such serious diseases with associated other symptoms. These are termed secondary headaches.

Migraine is the commonest and a relatively benign disease, which can cause headache. Other common causes

of headache are tension, side effects of medicines, cluster headaches etc. In these cases of headache patient's reports are completely normal and there are practically no possibilities or danger of any disability or paralysis. These are therefore called primary headaches. In addition to above reasons of headache; depression, alcohol addiction, spondylosis, sinus infection, weakness of eyes, glaucoma, or neuralgia, etc can also cause headache.

### **Migraine :**

Migraine is quite a widely well-known disease. During its attack the patient becomes extremely helpless and disturbed. This disease can affect 20 % of the adults with varying severity. A patient experiences this attack usually 1 to 6 times in a month on an average (or even daily). The pain can either be unilateral or bilateral (right or/and left). The pain is of a pulsating kind, which increases with exertion. Nausea, vomiting, blackouts and photophobia may accompany and it is difficult to look directly towards light. The pain may continue for 4 to 72 hours. Five such attacks are required for the diagnosis of migraine. Usually, the pain subsides after taking rest or after vomiting.

### **Types of Migraine :**

1. Common Migraine
2. Classic Migraine (where symptoms related to sight or vision are essential)
3. Migraine where temporary paralysis can occur (Hemiplegic migraine)
4. Cluster headache, and
5. Complicated Migraine.

Migraine can occur due to changes in food habits or lifestyle. Therefore discipline in life and food habits, mental peace, sufficient rest, prevention of constipation and less exposure to sun, (and if it is essential to go out in full sun wearing goggles) etc. are the standard suggestions a doctor should always give to his migraine patients. Consumption of chocolates, cheese, coffee, Chinese food, sour fruits, red wine etc. can cause migraines and therefore should be avoided. Fasting, dehydration, late nights and mental tension can trigger a migraine attack. (Sometimes sexual intercourse, environmental changes, noise pollution, contraceptive pills, or menopause can also aggravate migraine).

All migraine patients need to undergo a complete physical check-up. In many cases the help of CT scan and MRI is also taken for the purpose of reconfirmation of diagnosis and treatment. In migraine cases, CT or MRI Brain Scans are normal, therefore, these are called primary headaches. Proper drugs and regulation of life and diet as mentioned above can effectively control migraine.

### **Important Medicines :**

#### **The medicines to be taken during attack :**

When the attack starts, the drugs to be used immediately are paracetamol, antiemetic drugs (to stop vomiting), painkillers like nimesulide, ibuprofen, or in some cases ergotamine, (oral, inj ectable or as suppository) can help decrease the intensity of the attack. Among the new medicines, sumatriptan (pill or injection) naratriptan have proved to be very effective.

#### **Medicines to Prevent an Attack :**

The other type of medicine like beta-blockers, flunarizine, and amitryptiline, if taken for a considerable period of time,

can reduce the frequency of migraine attacks. As mentioned earlier, diet and life style should also be altered accordingly.

### **Spastic Headache**

This type of headache is as common as migraine. As the name suggests, headache results from spasm or tension in the muscles. Headache may be bandlike, persistent and occur almost daily. Hence the characteristics differ from migraine, Physical examination and X-ray, CT Scan etc. are usually normal. The treatment is also different from that of migraine.

First and foremost it is important to define the factors causing stress and try to eliminate these. Commonly these include familial, social, financial or health problems. It is important to discuss them with patient and relatives, so as to sort out the problems. As mentioned ahead in the chapter on stress and -its management; relief from mental stress benefits the patient. Moreover, exercise, meditation, yogas also have therapeutic benefits. If required we can resort to hypnosis, autosuggestion, biofeedback etc.

Appropriate treatment by a neurophysician or physician and if required psychotherapy by a psychotherapist can relieve the patient from spastic headache. Drugs for anxiety, depression, mood changes etc. are also used. Drugs for relaxing the muscles also help. Dietary modification is suggested. Analgesics (drug for relieving pain) are used sparingly. When abused, these drugs only aggravate the headache.

Also there may be side effects on liver, kidney or, blood cells. These patients suffer from headache of drug abuse. They need to be handled tactfully, by slowly withdrawing the analgesics.

As mentioned earlier, if immediate treatment is given in cases of headaches, which occur due to infections of brain e.g., meningitis, the life of the patient can be saved. Brain tumor can be detected with the help of MRI and CT scan, and can also be treated by proper treatment and surgery. Similarly, intensive treatment of hemorrhage can save lives in most of the cases. The headaches worsen by use of excessive medicines or addiction to painkillers. In some cases headache can have more than one cause like migraine and sinusitis. It is also essential to rule out easily curable diseases which cause headaches like sinusitis, ophthalmic disorders etc.

### **The serious symptoms :**

The symptoms usually associated with headache of serious origin are given below. In such cases immediate diagnosis and treatment can save lives, which is the main intention of this chapter.

### **Headache along with**

1. Seizure, vertigo, blackout, stumbling or paralysis on one side of the body, speech loss or memory loss, unconsciousness.
2. Fever.
3. A headache immediately after getting up from sleep, pain aggravated by sneezing or coughing.
4. Severe headache for a few minutes.
5. Headache in children.
6. A gradually aggravating headache in a person above 50 years. If the temporal artery becomes thick or starts paining with symptoms like exhaustion, low-grade fever, weakness, temporal arteritis may be the cause. In such cases, blood ESR is very high. It can be confirmed by biopsy and treated with steroids carefully.

7. Pain not controlled even after taking painkiller medicines.

If headache is accompanied by above symptoms then it is necessary to be cautious. The cause of these symptoms may be a swelling in the brain, a tumor or an infection. If the headache is not accompanied by such symptoms then there is nothing much to worry.

One of the other well-known and important reasons for headaches is **Neuralgia**. We will now discuss the condition called Trigeminal Neuralgia in brief.

### **Trigeminal Neuralgia :**

The simple meaning of neuralgia is pain in or along the nerves. The pain affecting the area, which a nerve covers i.e. from where the nerve takes the impulses to the brain, is called Neuralgia. It is quite commonly observed in particular nerves like the fifth and ninth cranial nerves ... etc. Such neuralgic pains can occur in the nerves of the chest, stomach, of the skin, and limbs. It is worth noting that Herpes Zoster viral infection occurring on the skin affects and inflames the nearby nerve causing very painful neuralgia.

Trigeminal nerve is the fifth cranial nerve and pain of this nerve is called Trigeminal neuralgia. This pain is shooting and momentary like an electric shock, which is very painful and keeps recurring frequently. This can occur from 1 to 2 to 100 to 200 times in a day, which leaves the patient very helpless and in a lot of agony. The pain may be triggered off by the touch of cold water or air or opening the mouth for eating. Trigeminal nerve is divided into three parts. If the first part gets affected, the 'pain occurs on the forehead, if the second part is affected the pain affects the cheeks and if the third part gets affected the pain is on the jaw.

Usually, a neurological examination is unremarkable. But if the sensations are reduced in the affected part or signs of disturbance of other cranial nerves are also seen (e.g. sixth or seventh cranial nerve also seems to be affected) or if the patient is below the age of 40 years, then it is essential to do an MRI brain (with contrast) or MR angiography, because in some cases there may be a tumor on or around the 5th cranial nerve or a disease called multiple sclerosis (which is less common in India).

The initial treatment of Trigeminal Neuralgia is done with medicines. The main drugs are - carbamazepine (tegrital, carbatol, zeptol etc). They are effective in 80% of the patients. In other cases phenytoin, gabapentin, clonazepam, baclofen etc. can be used.

Painkillers can also be added to reduce the pain. Local injection of alcohol in the nerve can relieve the pain for 3 to 4 months. Actually, the correct treatment of Trigeminal Neuralgia is to do RFTC Radio Frequency Thermo Coagulation to treat the nerve. This is an effective method, with up to 90 to 95% success rate. In some cases if drugs are not effective, nerve resection surgery (rhizotomy) can be done. All these treatments are available with neurosurgeons in the main centres of India .

### **Vertigo :**

According to a survey, vertigo-unsteadiness is the third most common symptom after chest pain and generalized weakness fatigability in patients coming to the O.P.D. -

Approximately 50% of the patients in geriatric age group present with this complaint at some point of time. When a patient comes with complaint of feeling of things



revolving around him/her or feeling that he himself is revolving or feels imbalance, then he/she is said to have giddiness-vertigo. If the patient complains of momentary blackout or imbalance or vague generalized weakness and restlessness, it cannot be considered vertigo.

**The main causes of vertigo include :**

1. Giddiness on change of posture or position (benign positional vertigo)
2. Vestibular Dysfunction (Vestibular apparatus located in the inner ear helps maintain the balance of the body).
3. Disease of the Cerebellum
4. Meniere's disease
5. Decreased circulation in the brain.
6. Fear of falling
7. Other causes

Giddiness may start suddenly and last for few minutes, or it may be prolonged. Occasionally it comes in bouts lasting for few seconds.

Most common and important among these, is giddiness, due to vestibular dysfunction. This could be either due to vestibular neuronitis where in, the vestibular nerve is affected by virus or labyrinthitis, where in addition to giddiness the patient has deafness or tinnitus. Both these syndromes are associated with vomiting.

If giddiness is associated with vomiting, one must look for herpes, labyrinthitis, problem of cerebellar blood circulation or brain tumor. Acoustic neuroma is the common brain tumor that presents with progressive giddiness, deafness, unsteadiness, cerebellar signs in addition to headache, vomiting.

Meniere's disease results from inflammation of the inner ear or disturbance of endolymph circulation. (Endolymph is the fluid in the semicircular canals which comprise the vestibular apparatus). This causes giddiness, deafness, tinnitus, vomiting. The symptoms may last for few minutes to days and then the patient may become completely symptom free. However, episodes may recur and then deafness and tinnitus become permanent. These patients should restrict salt in their diet and avoid coffee and chocolates.

Among the aged, benign paroxysmal positional vertigo is common. The patient has giddiness for few seconds on change of posture or position. There is no serious problem in the brain. In the geriatric age group, fall of blood pressure on getting up from supine or sitting position can also cause giddiness. This is known as orthostatic hypotension.

The treatment differs according to the cause of giddiness. Commonly for symptomatic relief, antihistaminics, antianxiety, anticholinergic drugs e.g phenothiazines and even diuretics or newer drugs like Ondansteron are given. Dietary changes (viz. salt restriction) are recommended. In special cases. In some cases adaptation exercises also help.

Along with the drug therapy, small surgical procedures can also give relief. Brain tumor needs surgery in any case. If there is insufficient blood circulation, appropriate drugs should be used. Hence with adequate treatment most of the patients can get relief from this distressing symptom.



# 8

## MOVEMENT DISORDERS AND DYSTONIA

The movements of the human body are mostly voluntary and are dependent on three major groups of neurons & tracts, each of which comprises a different system.

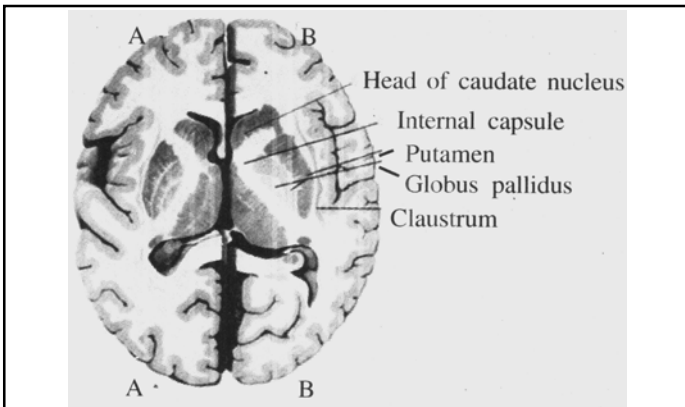
1. Pyramidal system.
2. Para pyramidal system.
3. Extra pyramidal system.

The first system is the most important of them all. The hindrance in the normal working of this system leads to paralysis, i.e. defect in the neurons causes the organs to stop functioning, gradually leading to spasticity.

1. **Pyramidal system** arises from the neurons of the posterior portion of the frontal lobe of the brain and the anterior part of the parietal lobe, which form the corona radiata, and passes through the posterior portion of the internal capsule situated between the basal ganglia. [Please see picture: 2 chapter: 1 ]. It then passes below 'the cerebral peduncle forming the pyramidal tracts. These tracts decussate in the medulla and pass to the contra lateral halves of the spinal cord, as the crossed lateral corticospinal tracts. These end into the cells of the spinal cord, known as anterior horn cells. It is these lower motor neurons that ultimately control the movement of the limbs. The orders from the brain are sent through these lower motor neurons so that the movement of the body is initiated. This entire process is completed in less than a second. Thus the frontal lobe of the brain is the main part of the entire system. Also -along with this there is another part of the brain known as supplementary motor

cortex that generates messages before movements. The contribution of this part is also very high. Any damage to the pyramidal system results in paralysis.

2. The Para pyramidal system mainly consists of rubrospinal, tectospinal, reticulospinal, and vestibulospinal tracts. Its main function is to influence the pyramidal system in such a way that voluntary movements are conducted in a particular systematic way. Red nucleus, tectum etc. various parts of the brain are associated with it. Any damage to it results in symptoms like imbalance, tremors etc.
3. The diseases we are going to talk in this chapter are called movement disorders. The nuclei or cluster of cells affected in these disorders are chiefly basal ganglia which are situated in the middle of the brain on either side. This system is called extra pyramidal system. We will discuss the diseases known as movement disorders. The neurons present in the middle part of the brain called basal ganglia perform a very important activity and form the extra pyramidal system.



As shown in the picture the system consists of frontal lobe, globus pallidus, putamen, caudate nucleus, claustrum and amygdala etc. This system controls the pyramidal system in its own way. Any fault or cessation of function of this system does not produce paralysis but can create two types of problems which we call as syndromes.

- a. Akinetic rigid syndrome (Parkinsonism- which will be discussed in detail in the subsequent chapter) in which there is stiffness of limbs and all functions become slow, there is also trembling in the limbs and all movements becomes slow. This occurs due to the deficiency of a chemical called dopamine in the brain.
- b. Hyper kinetic disorders: In short, an excess of dopamine in the brain results in hyper kinetic disorder. Here uncontrolled extra movements like dystonia, chorea, dyskinesia and hemiballismus accompany the voluntary movements.

### (A) Dystonia

If any movement continues in the same abnormal posture for a long time then it is called dystonia. If the neck remains pulled and bent towards one side then it is known as cervical **dystonia** (Torticollis). If the eye and facial muscles are pulled towards one side again and again, it is called **hemifacial spasm**. If the eyes keep closing involuntarily, especially if it becomes difficult to keep the eyes open while talking to someone, it is called **blepharospasm**. If the surrounding parts of the mouth or the tongue move abnormally then it is called **facial dystonia or meige's syndrome**.

Another condition known as writer's Cramps is a well known disease. In such cases the patient suffers from writing problems. Initially there is deterioration in handwriting.

The writing speed becomes less. And eventually the patient cannot even sign his name. People like clerks and teachers who have to write a lot, find it very difficult to cope in their profession or job. For example if an executive has difficulty in signing cheques then they may bounce or if there is a difference in the signatures on contracts, it may lead to serious trouble. And the interesting part is that the patient suffers from difficulty only in writing. He may not have any problems in eating or holding objects and there are no symptoms of paralysis. Other Dystonia are similar. In a similar way if the voice thins, down or the person has problems in speaking, it is called vocal cord Dystonia.

According to an opinion, there are more than 100 types of such Dystonia. If a violin player suffers from a finger Dystonia, the musician can lose his name, fame and living. If a tabla player suffers from a finger Dystonia, the music rhythm can change completely. One can thus imagine how this disease can affect careers.

This Dystonia occurs due to defects in the working of basal ganglia. Due to an increase in dopamine, the movements of the patient increase or some muscles constantly remain contracted causing disruption in rhythmic movements and as a result the trouble occurs.

The above mentioned Dystonias are usually primary and normally occurs in young people. The reason for this is unknown. This can occur due to either mental tension or repeatedly and continuously doing the same work (like writing). But why it happens to only a few of such innumerable people doing similar work is still not known. It may be possible that the disease occurs due to the combination of various factors related to genetic or hereditary

reasons, environment as well as the lifestyle, food habits or psychological makeup of the patient.

Whatever may be the causes, it is equally difficult to treat such cases. Medicines for such kind of diseases are given on the basis of inference, as the cause is unknown. For example trihexiphenydil, haloperidol, benzodiazepines (like Clonazepam), tetrabenazine etc. are given either as a single dose or in combinations. The dose also varies from patient to patient. But these drugs are effective in only 30% to 40% of cases and that too not completely. The drug is effective only till it is taken and the patient feels better temporarily. With passage of time the effectiveness of the drugs decreases. But the side effects of these medicines are a cause of concern especially for young patients. Therefore, doctors are advised to use them with discretion and not prescribe them extensively.

Instead of these drugs, a novel treatment called Botulinum injection (botox), which when injected in the muscles in an appropriate dose gives good results in various types of Dystonia. It has been found to be miraculously effective in all the above-mentioned Dystonia, from cervical Dystonia (Torticollis) to blepharospasm, hemi facial spasm, writer's cramps etc.

Neurologists trained in using these injections are there in Delhi, Mumbai, Ahmedabad, Kolkatta and many other places. They decide the dose and location of the injection to avoid side effects. For example, it is given particularly in the muscle where there is maximum contraction so as to bring it back to normal. The functioning of the muscle becomes normal and the pain is relieved, cosmetically too it helps the patient and he or she can return to his or her routine job.

This injection is moderately expensive and at present the treatment cost of hemi facial spasm is around Rs. 4,000 to 5,000 and for blepharospasm it is around Rs.6,000. It has to be administered every 4 to 6 months as its effect gradually diminishes. Sometimes it is difficult to identify the muscles affected and a test called E.M.G test has to be done to locate these. If an excessive dose is given, the muscles become weak for a few days, like the eye-lid drooping over the eye (in case of blepharospasm the injection is given in the eye-lids). Therefore, it is essential to take this injection from a neurologist or a specially trained physician.

These Botulinum injections are available as Botox, Portox injections. They form such a bond at the presynaptic cholinergic terminal of the synapse\* (the junction where the two neuron meet) that the muscle fibres controlled by these nerves undergo functional denervation and weaken them. This weakness lessens gradually. The treatment by botox injection is rapidly gaining recognition even in cases where there is contraction or pain in the muscles without dystonia. It is also effective in the spasticity and abnormal posture occurring due to paralysis. But the effectiveness of this injection decreases in 4 to 6 months This injection is also useful in the treatment of other problems ranging from spasticity due to cerebral palsy, muscular pain and even cosmetic purpose like wrinkle removal. The dosage can range from 2 units in small muscles to 150-200 units.

Dystonia can be controlled to a large extent by drugs as well as Botulinum toxin injections and necessary surgery can also be resorted to. Surgery includes Rhizotomy, denervation



procedure etc. In some cases spinal cord stimulation can be done. While in some cases of dystonia the exterior belts (splints) can also be used.

Some cases of Dystonia are called secondary Dystonia. In this case there are some defects in the brain like congenital metabolic disease of the cells, Wilson's disease, Dystonia musculiformans, brain tumor, blood disorders, side effects of drugs etc. Once these causes are cured Dystonia is cured too. But many of them however, cannot be controlled.

Apart from Dystonia, there are many other important movement disorders.

### **(B) Chorea:**

If a difficulty arises in the working of caudate nucleus situated in the basal ganglia, it causes a series of jerky, quasi-purposive movements of the limbs, neck face, etc. which often occur from one part of the body to another, again and again in the same order.

1. Chorea that occurs due to rheumatic fever.
2. Huntington's chorea (hereditary).
3. Senile chorea.
4. Chorea that occurs in diseases like diphtheria, whooping cough, rubella etc.
5. Chorea due to increase in thyroid.
6. Neuro acanthosis Chorea.
7. Chorea due to side effects of the medicines especially drugs for mental disorders, contraceptive pills, lithium, antiemetic drugs (for vomiting), mercury poisoning etc.

As described earlier chorea occurs due to an increase in the levels of the chemical dopamine and so drugs like haloperidol, chlorpromazine, tetrabenazine, reserpin etc. (that oppose dopamine) are used.

### **(C) Tremors :**

Shaking of fingers of the limbs and sometimes of the neck and lips in a continuous, rhythmic manner is called tremors. This is the most common movement disorder. Y

Many a times it may also occur in normal people due to tiredness, lethargy, drug side effects, intake of coffee or pregnancy. The medicines that can cause tremors as a side effect are steroids, theophylline (used for asthma); lithium, tricyclic or antipsychotic drugs (used for mental diseases) and valproate (used for seizures). Tremors may also occur due to an increase in the levels of thyroid hormone.

In many cases tremor can be hereditary which is called familial essential tremor. Some people also experience tremor because of old age. Tremor is one of the main symptoms of Parkinson's disease.

Different medicines are used for the treatment of tremors caused by different reasons. They are beta blockers (propranolol), diazepam, clonazepam, gabapentin, primidone, etc. and dopaminergic drugs for Parkinson's disease. In selective cases surgery can also be done.

### **(D) Tics :**

Repeated, quick, habitual movements are called tics. 5 % of the children have the habit that cures itself as they grow up. This can also happen due to side effects of medicines or viral disease. However, the worst form of Tics

is seen in Gilles de la Tourette Syndrome. It accompanies behavioral changes, (ADHD, OCD) and utterance of obscenities is also seen. This should be treated accordingly.

**(E) Finally**, the movement disorders occurring due ‘to the side effects of some modern medicines can be summarized as under:

1. Dyskinesia: Dystonia or chorea that occurs due to medicines like phenothiazines, levodopa etc
2. Dystonia: The sustained contraction state of the limbs occurring due to the drugs of neuroleptic group 3.  
Akathisia: An uneasy state due to the use of antipsychotic medicines.
4. Parkinsonism: For example haloperidol; Parkinsonism occurring due to medicines for psychological disorders.
5. Chorea: Due to contraceptive pills
6. Neuroleptic Malignant syndrome: The severe reaction occurring due to anesthesia during surgery.
7. Tardive dyskinesia: Chorea or dystonia occurring due to the long-term usage of neuroleptic medicines.



# 9

## PARKINSONISM

In the year 1817 Dr. James Parkinson described the symptoms of this brain disorder in detail for the first time, and therefore, this disease is now known as Parkinson's disease. It is a common and troublesome disease affecting old people. In this disease; there is progressive cell degeneration in the region of the brain known as substantia nigra reducing the formation of an extremely important biochemical substance, dopamine. Because of this, symptoms like lethargy, decrease in co-ordination, tremors, rigidity of muscles etc. occur. The beginning affects one side of the body, i.e. either the left or the right side. Usually it spreads to both the sides in a few years.

### **Symptoms :**

1. While at rest, the fingers of the hands and legs shake in a peculiar manner (pill-rolling movement or rhythmic movement as if the patient is counting money.)
2. The patient stoops and his gait shuffles and there is poor arm swinging.
3. All movements of the body become slow.
4. The 'muscles in the hands and the legs and the face gradually become rigid.
5. Handwriting becomes smaller.
6. The speed of walking becomes slow and while walking the patient suddenly stops.

7. There is decrease in memory and depression with increased perspiration and body ache. The Voice reduces and becomes monotonous, facial expressions disappear, dribbling of saliva occurs from the mouth and frequency of eye blinking is reduced.

If such symptoms are seen, it is essential to consult a doctor and get the diagnosis done. Medically this disease is divided into five stages.

This disease occurs primarily due to aging effects on the brain, but the exact reasons are still unknown. Side effects of medicines, head injuries, injuries due to poisonous gas, or biochemicals, viral infections and in rare cases hereditary reasons may also be responsible for this disease. However, in majority of the cases the reason remains unknown (idiopathic).

Sometimes, it may also occur as a part of some other bigger disease like multisystem atrophy or progressive supranuclear palsy. In this many other symptoms are present along with tremors.

Parkinsonism can affect one person out of every 500 people. 1.5% of the people in the age group of 60 or more suffer from Parkinson's disease. However, it may sometimes be seen in young people. The symptoms of Parkinson's disease occur when 80% of the cells producing dopamine are destroyed. There is no treatment or medicine available to stop the destruction of the cells. Thus, this disease can never be cured completely. However, regular treatment can control the symptoms to a large extent. Modern treatment methods and exercise can give considerable relief in this disease and help live a long comfortable life.

## Treatment :

Medical treatment consists of levodopa; dopamine agonists like bromocriptine, anticholinergic drugs like pacitane etc. Among these levodopa is the main drug, which directly introduces dopamine in the brain, the deficiency of which causes the disease. The dose is decided on the basis of the severity of the symptoms. It is essential to consult a specialist in this matter as this drug can cause serious side effects. This medicine can be given to the patient in different proportions and forms like tablets, liquids and pumps. Many specialists prefer to use **Trihexyphenidyl, Amantadine, Bromocriptine, Pirebidil**, etc in the initial stages of the disease instead of levodopa and firmly believe that when the disease reaches the second and third stage (affects both sides of the body), only then levodopa should be used so that the patient can lead a long comfortable life without much side effects. If Selegiline is given in the first stage of the disease, further progression of the disease can be slowed down to some extent.

This disease is divided into five stages, for example in the first stage there is shaking or spasticity only on one side of the body and in the last stage the patient is totally bedridden. The treatment of each stage is decided by the neurophysician. The treatment of each and every patient may vary.

During the last few years there have been a lot of important discoveries for eradication of this disease which have instilled a new hope in the doctors as well as patients. **Premipexol, ropinirol, tolcapone, and entacapone** are some of the drugs, which are very effective and have very

less side effects. At present these drugs are not manufactured in our country and therefore are very expensive. Recently ropinirol is introduced in Indian market.

There is an opinion that vitamin-E and a few other elements help in reducing the intensity of the disease, however there is no consensus of opinion amongst neurologists about this issue.

### **Surgery :**

Surgery has opened newer avenues in the treatment of Parkinsonism. Few decades ago, surgery was considered as a treatment option, but with the advent of the drug Levodopa which had significant beneficial effects, the surgical option took a back seat. However, long term and persistent side effects of Levodopa made doctors reconsider the therapeutic option of surgery. Over the last decade, there has been immense progress and each new day adds to the experience of surgical procedure in the patients of Parkinsonism. The procedure is becoming safer. The discussion as to when and what type of surgery should be done acquire prime significance in many medical conferences. Three types of surgery can be considered for Parkinsonism.

- 1. Ablation Surgery :** Ablation (literally means cutting off) at an appropriate spot in the neuronal circuit (responsible for Parkinsonism) is carried out using stereotactic method. This spot could be the thalamus, pallidum or subthalamic nucleus. Accordingly it is known as thalamotomy, pallidotomy etc. When tremors predominate and especially in young patients, thalamotomy is preferred. Pallidotomy can be done to

treat levodopa induced dyskinesia. The results of surgery are good. However, once ablated the neuronal damage is permanent. Besides, occasional complications like hematoma (collection of blood at the site of surgery) or infections can occur, though the rate is very low. The cost of surgery comes to approximately Rs. 30,000 to Rs. 60,000. Surgery is done only in one hemisphere at a time.

- 2. Stimulation Technique :** Instead of permanently ablating the specific neurons, they can be stimulated (hyper excited) to the extent that they lose their functioning capacity. This is the basis of the stimulator technique. Hence, a stimulation electrode and circuit are fitted into the relevant part of brain. Hence, thalamic, pallidal or subthalamic stimulation can be done. However, at present results of subthalamic stimulation technique are excellent. This method does not cause permanent neuronal damage and for variable result the degree of excitability can be varied. Side effects are minimal. However, this is an expensive mode of treatment. For setting a stimulator in one hemisphere, the cost amounts to Rs.4 to 5 Lacs. Stimulator can be set in both the hemispheres. In some cases, ablation surgery in one hemisphere and stimulator electrode in the other can prove cost effective and thus bilateral symptoms can be controlled. These facilities are available in some centres in our country as well as in foreign countries. insurance facilities make it easier to avail the patients of these techniques.



**3. Transplant Surgery:** This is still in its experimental stage. Here cells from the adrenal gland are transplanted into the brain. Some time back fetal cell transplant was tried, however, due to certain ethical issues and medicolegal problems, this did not gain momentum.

Besides, the medical and surgical treatment various factors like regular exercise, staying happy, meeting groups, yoga etc. prove very important in the treatment.

In short, now-a-days, Parkinson's disease is not a disease to be scared of. Early diagnosis, appropriate treatment under the guidance of an expert physician or a neurophysician, group therapy, exercise, yoga and if necessary surgery can control this disease to a large extent. In the cities like Ahmedabad and Mumbai, there are associations of patients suffering from Parkinsonism, which give relevant information regarding the disease, teach exercises and yoga in groups and provide other services to the patients.



# 10

## DEMENTIA AND TIPS TO IMPROVE MEMORY

### **Dementia :**

In layman's words dementia means loss of memory. Actually in dementia a patient's memory, thinking ability, communication skills (to understand language and make others understand) and behavior are affected. Patient's speech, behavior and characteristics as an individual changes considerably. Since intelligence is affected many questions arise.

### **Causes of dementia :**

There can be many causes of dementia. In about 80% of the patients the cause is Alzheimer's disease or vascular dementia. In addition to that, Lewy bodies disease, Creutzfeldt Jakob disease, Huntington's disease, Sub cortical Leucoencephalopathy, A.L.S etc also have symptoms of dementia. Amongst the other causes of dementia are diseases of thyroid, parathyroid, diabetes, effect of toxic chemicals, and heavy metals etc. Thus there are many causes of dementia.

### **1. Symptoms of Alzheimer's Dementia :**

In the initial stage of the disease the following symptoms are seen.

- Difficulty in speech/language (To understand and to speak meaningfully).
- Loss of memory (difficulty in remembering recent events). Many a times the past memory remains intact; till late.

- The decision making power reduces.
- The orientation of time and places gets affected Depression, loss of interest in life, excessive anger. As the disease progresses the patient finds difficulty in carrying out routine day-to-day activities.
- The patient starts forgetting his day-to-day incidents and the names of his near and dear ones.
- The patient makes mistakes in recognizing his relatives, friends and familiar things, and starts keeping things in wrong places.
- Becomes dependent in matters like cooking, cleaning or shopping.
- Needs help even while bathing and wearing clothes. There is difficulty in talking or communicating and also in moving around, patient loses road sense.
- The **patient suffers from hallucinations.**
- He/She has difficulty in eating and drinking.
- He/She may find it difficult to analyze situations.
- There is difficulty in walking.
- Due to change in temperament, he/she gradually loses touch with near and dear ones.
- Loses control of bowel and bladder movements.
- Behaves abnormally in public.

Medically this disease can be divided into three stages and in the final stage the patient becomes completely dependent.

### **Causes and treatments :**

The exact cause of Alzheimer's disease is not known. But the brain cells, which control a patient's thinking, memory, language, etc., are destroyed. The reason of this destruction is not decreased blood circulation, infection or aging.

It is a well known fact that many famous people like former American President Ronald Reagan, Rita Heyworth, Sugar Ray Robinson, E B White and others have suffered from this disease.

An accurate treatment for this disease has not yet been found. However, extensive research is being carried out to design drugs to decrease the intensity of the symptoms. If the disease is diagnosed in the initial phase, it can help the patient to a great extent. The patient and his relatives should have proper information and education regarding the disease in order to cope with day-to-day problems and difficulties.

### **Diagnosis :**

- Along with the earlier mentioned symptoms, various cognitive tests for testing the patient's memory, understanding, linguistic co-ordination can confirm the diagnosis of dementia. Mini mental status examination, word list memory test, work recall test and various neuropsychological measures are used to diagnose the disease and its intensity.
- Blood tests, blood sugar levels, thyroid test, liver and kidney functions, vitamin B 12 and folic acid levels etc. can also help in diagnosis, as they are usually normal in these patients.

- E.E.G. can help the confirmation of the diseases like Jacob Creutzfeldt disease as well as Frontotemporal dementia.
- Sometimes CT scan, MRI, MR Angio, SPECT, PET etc. neuroimaging methods are also required for the diagnosis.

### **Recent developments :**

Research is going on to determine the causes and treatment for Alzheimer's. In 5 to 10% of the cases, it is hereditary. For example if the patient has E-4 Apolipoprotein gene on the 19th chromosome, there are high chances of his offsprings suffering from Alzheimer's disease.

The formation of neurofibrillary tangles in the neurons of the brain and accumulation of plaques of a protein called Beta-amyloides outside the cells, causing damage and edema in the fragile brain cells, is the pathological hallmark of Alzheimer's disease. But the reason behind this process is still unknown. It is possible that a protein named APOE and other biochemicals called TAU are responsible for this entire process. The latest research is focused on stalling these processes.

Donepezil (Donecept, Donep) is an effective medicine for patients of Alzheimer's disease. Amongst newer medicines there are Rivastigmin (Exelon) and Galantamine (Reminyl) with even better results. Similar other medicines are also being studied. Tacrine (cognex) is now less used because of its side-effect profile.

Other treatments like genetic engineering and cloning are still in experimental stage. In our country, cost is a problem and therefore Piracetam (Normabrain; Nootropil) or Ergot group of medicines are more popular to these costly newer drugs.

## 2. **Multi-infarct Dementia :**

When a decrease in the supply of blood to various small portions of the brain damages the cells in those areas then Multi-infarct Dementia results. A rise in the blood pressure damages small capillaries and small clots are formed in these capillaries, which results in lowering of the blood supply in certain parts of the brain.

This disease can start abruptly or may slowly progress. Initially, memory loss (especially the memories of the recent events) takes place. The symptoms tend to fluctuate. Insight into the disease remains relatively preserved. Individual characteristics of the patient still remain more or less intact. But as the disease progresses, the condition of the patient deteriorates substantially. This can also be accompanied by paralysis, depending upon the location of the infarcts.

A perfect and confirmed diagnosis can be made on the basis of symptoms as well as CTScan, MRI and MRAngio. Therefore, the diagnosis is much easier compared to Alzheimer's. The lipid profile, Doppler of the blood vessels of the neck, 2D Echo of the heart etc are the tests which are specially helpful in the detection of the disease.

Along with the drugs for thinning of the blood, regulating blood pressure and diabetes strictly, maintaining discipline in eating habits and regular exercise are very essential to prevent this disease. In short, this is largely a preventable disease.

### **Special Care of a Dementia patient :**

- The daily routine should be set in such a simple way, that the patient can remain as independent as possible. Similarly, steps should be taken for protection of the patient.
- If required, the patient should be helped in his day-to-day activities like taking bath, wearing clothes and eating.
- The patient's troubles can be lessened by using methods that help him in remembering things, like maintaining a diary.
- It is essential to keep having conversations with the patient so as not to hurt his/her feelings.
- The schedule of the patient should be easy to follow. Besides, latest medicines like **Rivastigmin, Donepezil, Antiplatelet drugs**, etc. can be prescribed according to the cause of the disease.

It is a matter of debate whether healthy close relatives (daughter, son, sister, brother) of people suffering from Alzheimer's dementia or others (which are hereditary) should get themselves examined as a precautionary measure. In some countries such facilities are available where genetic investigations can accurately predict the possibility of a person suffering from this disease in future.

Sometimes, symptoms similar to dementia can also be seen in severe mental stress or depression. This is known as **Pseudodementia**. Appropriate neurological tests can be used to detect this disorder. Its treatment is, comparatively simpler. This can be controlled and there are no long term or aggravating symptoms.

In many other diseases also, some level of memory, behaviour and individual characteristics can get affected. In many such cases, Alzheimer's disease is wrongly diagnosed, for example, Hypothyroidism, vitamin deficiency, and many collagen diseases like S.L.E etc.

### **Drugs :**

Appropriate drugs are used according to the cause of the disease.

1. Antiplatelet and vipocentin: In vascular dementia.
2. Drugs of the Ergot group like - Sermion, Hydergine, Cereloid.
3. The special new drugs like Rivastigmin, Donepezil, Tacrine, Galantamine etc. can be given in Alzheimer's dementia.
4. Piracetam for e.g. Normabrain, Nootrophil, Cerecetam or Encephabol.

### **Prevention of Dementia and Improving Brain Power :**

It is believed that as the age progresses the cells in the brain degenerate, gradually resulting in loss of memory as well as mind power. But this is not completely true. Recent research has shown that if the right kind of environment is provided there can be development of the new nerve fibres in the brain of older or aging people. Memory can be kept relatively intact till the end.

Proper blood circulation is necessary for the proper functioning of the brain. The day should start with some jogging, which speeds up the circulation of the blood in the body. This will result in more supply of blood and oxygen to the brain, which will keep the nervous system alert. One must also be particular about the kind of breakfast



to be taken after exercise. One should develop a taste for food rich in carbohydrates (glucose based) rather than fatty foods. After every one to one and half-hours of work, it is advisable to take a break for some minutes and move around for some time. Diverting the mind to a different subject after continuous working on a particular subject can make the brain more alert.

Lunch should also contain a lot of carbohydrates. Fatty foods should be restricted and protein content in the food should be in moderation. After meals one feels drowsy because the blood supply to the brain decreases, so only limited food should be eaten in the afternoon. Some kind of exercise should be done from time to time. If the body remains sedentary it becomes heavy. The same is the case with the brain. In this age of calculator and computer, the brain is not put to much work. Therefore, one must make a habit of playing games like memory games, or crosswords (neurobics etc). Try to use memory as far as possible, for example, avoid making a list while going for shopping. Try remembering telephone numbers or birthdays of friends and relatives or at least try to remember the birthdays of close relatives and family members. The fact is, that there is no magical solution to improve memory. Exercise makes our mind and body stronger.

Fatty foods should be avoided during dinner too. Provide more calcium to the body. Milk, bananas and dry fruits should be given preference. The body also needs enough rest along with exercise. It is important to get sufficient sleep. The mind remains active even during sleep. One should end the day with positive thoughts without any worries, which is not a very difficult task.

**Tips to improve working of the brain :**

1. Control stress because it produces damaging chemicals in nervous system.
2. Yoga and meditation increase the mental powers and so it should be practiced.
3. Sufficient sleep is very important for development of memory and working of the brain.
4. Tobacco, alcohol and drugs are injurious to the brain. Thus keep away.
5. Make friends and be socially active.
6. Develop positive thinking in yourself.
7. Regular mental-physical exercise is important.
8. Eat food, which contains vitamins and iron. Avoid fatty foods.

**Few tips for students to improve memory :**

- While you settle down to study, keep your textbooks, notebooks, pen etc. with you, so that you do not have to get up frequently to fetch these things.
- Select a fixed place for reading. See to it that the reading room is adequately ventilated and well lighted. Avoid the disturbances of T.V., tape-recorder or telephones in the room.
- Always sit and read. Don't keep lying on the bed while reading.
- Keep a time-table for the entire syllabus and paste it in front of your reading table and follow it. Inform your parents or friends that you would not like to be disturbed.

- Before and after your reading session, close your eyes for a minute and take deep breath. If you find the subject difficult, resort to deep-breathing for 2 minutes so as to increase your concentration.
- Read each paragraph word to word and try to remember the contents. After some time try to recall what you' have read. Note down the important points Discuss what you have read with your friends and then open the book and confirm what you have retained.

### **Ribosomal Memory :**

As per the principles of Ribosomal memory following suggestions for retaining whatever is read are extremely useful.

- Read each paragraph carefully and try to remember each point thereof. Similarly to read the next one and after reading for a while, to keep the book aside and try to remember everything. To write all important points, or discuss with the colleagues and then review if any points are left out.
- While starting the next chapter to summarize shortly previous chapter.
- To repeat very briefly the same topic after 24 hours, 7 days and 30 days; help a lot to remember the topic permanently.
- One can use pnemonics or graphics or melodies to remember certain unusual things or long lists or more points.

- It is a good habit to underline important points preferably with yellow marker pen. That saves time and omits less useful information.
- To blink the eyes after reading for a while to remove the eye strain. One may press the eyes gently with palms. The warmth of palms render energy and bliss to the eyes. One can use cold water to splash upon the eyes.
- Not to read in one position for a very long time. To rejuvenate oneself, one may get up and walk around or breathe deeply or meditate for a while.
- While in examination hall, to remove thought block, one may close the eyes and try to concentrate. This will enable memory circuit to get activated.
- Technique of self hypnosis is also found to improve memory in many cases.

As mentioned early, there is no definite, effective or quick way to improve memory; however the method given above is time tested method to improve memory performance for students as well as other people.



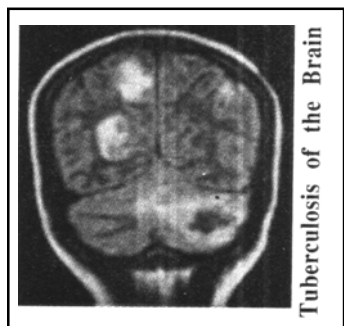
# 11

## INFECTIOUS DISEASES OF THE BRAIN

The brain is more prone to infection compared to the other organs of the body, like the heart. Especially, tuberculosis of the brain, meningitis of the brain, abscess of the brain, encephalitis (viral), falciparum malaria and other diseases due to parasites like cysticercosis, fungal infection of the brain, and sexually transmitted diseases like AIDS and various other kinds of infections can affect the brain.

If there is an infection in the nose and the ears with pus discharge, throat infection, infectious boils on the face, pus in the other body parts like the chest or septicemia, then there is a possibility of infection in the brain. If there is a head injury with bleeding from the nose or ears or a skull fracture with **C.S.F. Rhinorrhea** (discharge of C.S.F. from the nose) or any brain surgery (e.g. brain tumor) is done and the immunity of the body is less, the chances of infection in the brain increase. This can lead to headache, fever, seizures, paralysis, unconsciousness or even death. It is not possible to describe all these diseases here, but some important diseases will be discussed.

### 1. Tuberculosis of the Brain :



Usually, tuberculosis infection of the brain comes from other parts of the body like lungs or stomach. There is a possibility that the tuberculosis in the chest may be there for a long time, but a decrease in the immunity of the body due to any cause may

result in TB of the brain. This disease is so common in our country that the TB organism is present in the bodies of most of the people, having entered through milk or air and its immunity is already there in the body. When the immunity of the body is compromised due to any reason, and the body becomes weak, active disease develops. A patient of AIDS can get infected with innumerable organisms causing variety of diseases in which TB organisms are the main germs.

Tuberculosis infection in the membranes of the brain is called TB Meningitis and the TB tumor in brain is called as Tuberculoma. The infection of the cortex of the brain is called Encephalitis (Encephalopathy). Headache, low-grade fever, vomiting, loss of appetite, excessive weakness or anxiety are the initial symptoms of this disease. Gradually, seizures, paralysis of one or more limbs can occur and in advanced stage, coma due to the edema of the brain and even death may occur. If there is an obstruction in any small or big blood vessel of the brain due to TB, it is known as TB arteritis. TB can also cause paralysis. If the pathways of the C.S.F are obstructed, the result is **hydrocephalus**, in which the cerebral ventricles dilate leading to unconsciousness or loss of eyesight. A tubercular infection in the spinal cord or vertebra may lead to paralysis of the lower limbs.

### **Diagnosis :**

In order to diagnose this disease, a detailed medical examination as well as blood tests are required. The C.T.Scan or/and M.R.I are useful. Lumbar Puncture is almost an essential test for the confirmatory diagnosis of the infectious diseases of the brain. In tubercular meningitis the examination of the C.S.F shows high protein levels, low

sugar levels and high lymphocyte (a type of white blood cell) count. In some complicated cases, C.S.F.-P.C.R, C.S.F.-C.R.P, C.S.F-A.D.A tests are conducted for accurate diagnosis. This accuracy is necessary because once the diagnosis is confirmed the patient requires proper treatment for a minimum of one and a half years to two years. Initially, the C.S.F reports may sometimes present a picture of a viral or pyogenic infection and if there is a laxity in the treatment of any of the three infections due to lack of proper diagnosis, it could lead to dangerous consequences. Hence, proper investigations are very essential in these infectious diseases. Almost all the specialist physicians agree that the diagnosis should never be done with guesswork. But in situations where the edema in the brain is considerable, respiration is inadequate and the general condition of the patient is fragile, lumbar puncture test can be dangerous and at such times the treatment should be immediately initiated on the basis of CT Scan, MRI and other supportive facts. Lumbar Puncture can be done later, when general condition permits.

### **Drugs :**

The main medicines for the tuberculosis of the brain are streptomycin (SM) injections, isoniazid (INH), rifampicin (RF), pyrazinamide (PZ), and ethambutol, which are called the primary medicines. In resistant cases, sparfloxacin or ciprofloxacin, kanamycin injection, ethionamide or cycloserine can also be used as secondary medicines. All these drugs have some or the other side effects and therefore along with the symptoms of the patient, laboratory tests are regularly carried out. For example INH, RF or PZ can cause an inflammation in the liver and effects of jaundice. Hence doctors regularly carry out tests like S.G.P.T./S.G.O.T etc.

In case a problem is detected, the particular medicine is stopped for sometime. Vomiting, loss of appetite, red discoloration in the urine because of RF, are the usual side effects in majority of patients, but the drugs need not be discontinued because there is a considerable improvement seen in the patients within 4 to 6 weeks.

In case of an inflammation in the brain or CSF test showing excessive proteins, steroids are given for 4 to 6 weeks and if there are large tumors in the brain, a major surgery may be required. Small tumors can be removed along with biopsy by the latest surgery called stereotaxis biopsy. Surgery is rarely required for these tumors as they start resolving with the medicines. Normally CT scan or MRI are done after 2 to 3 months to note the improvement. CSF is rarely required to be done frequently. However in selected cases the drugs are given through CSF, which is known as the Intrathecal route. When the pathways of the CSF gets blocked and the ventricles start filling with fluid, the patient loses consciousness, has problems in walking, talking and understanding, vision diminishes or headache and vomiting take place. This is called hydrocephalus and it can be accurately detected with the help of CT Scan. In this case, a small tube is introduced in to ventricles of the brain through the skull, and the extra fluid is drained out through a tunnel beneath the skin up to the stomach via the tube. This process is known as **shunt surgery**. This is a simple operation with good results. However, problem can arise if the shunt becomes obstructed. If TB organisms are not controlled by the primary drugs, it is called drug resistance and the secondary medicines can be used. However, in some cases if the patient has totally lost the immunity



like in AIDS or if the infectious organisms are very resistant, such patients cannot be helped much.

## 2. **Pyogenic Meningitis :**

Apart from TB, this is an important and dangerous type of meningitis that occurs due to certain infectious organisms, which form pus in the brain. The pus is formed rapidly on the membranes of the brain and spreads more quickly compared to TB, leading to the deterioration of the patient's condition within a span of few hours or days. Symptoms range from high fever, severe unbearable headache, vomiting, pain in the posterior part of the neck and photophobia to ultimately unconsciousness, seizures and eventually death in a short time, in the absence of proper treatment.

The various types of **Gram-positive and Gram-negative** bacteria that can rapidly cause harm to the brain are, **meningococcus, staphylococcus, pneumococcus, streptococcus, listeria, H. influenzae, pseudomonas, proteus, E.coli etc.** An early diagnosis and treatment can cure the patient without any long-term disability or side effects. If there is a severe headache with high fever, there is always a doubt of an infection of the brain. If along with this, the person's speech and gait (walking) is affected, seizures or loss of consciousness occurs then, he should be immediately taken for a CT Scan even in the middle of the night and be admitted to the hospital and if necessary CSF examination should also be conducted so that the right diagnosis comes immediately for the treatment. These tests should be done under proper supervision in a reputed laboratory because the CSF report decides the appropriate antibiotic to be given to the patient and this decides the patient's future. No compromise should ever be done in such cases.

In meningitis, the CSF report shows hundreds and thousands of neutrophils with increase in protein levels while the glucose levels fall very low. Thus, the reports of CSF differ for TB meningitis and pyogenic, meningitis. These germs can be identified accurately under a microscope with the help of gram stain. From all these reports, the doctor decides the immediate drugs. In all the cases, it is necessary to carry out CSF culture and sensitivity test, the results of which are available in 48 to 72 hours. This allows the doctor to decide whether the medicines, which are prescribed prior to the test, are accurate or need to be changed. If required Latex particle Agglutination, serological tests for syphilis, virus isolation test, immunoassay, test for fungus and PCR test for TB are carried out. Thus, it is confirmed that the patient is definitely suffering from pyogenic meningitis and appropriate drugs are given after identifying the disease causing organisms.

**Drugs :**

If necessary drugs like cephalosporin, penicillin, vancomycin, gentamycin, chloramphenicol, metronidazole etc. are administered. All these medicines are very effective and 80 to 95 % cases can be cured if these drugs are used in appropriate dose and combination at an early stage. Usually, these medicines are given for 10 to 14 days continuously and if required, changes can be made on the basis of the culture report. The medication is stopped only after another C.S.F examination shows that all organisms have been destroyed and no more pus formation is taking place. Even if a little infection remains in the brain, there is a possibility of a recurrence of the disease in a short time. Now the same drug may not be effective, this is called drug resistance.

If there is an extensive edema in the brain or there is seizure or paralytic attack on one side (focal symptom), a CT Scan should be immediately done. There may be an abscess. In such cases lumbar puncture is not carried out and suitable medicines are given. If necessary, surgery is done or the pus is extracted from the abscess by an expert neurosurgeon. This can save the life of the patient.

Increase in the swelling of the brain (raised Intracranial tension), seizure, hydrocephalus, subdural effusion or subdural empyema (abscess between the membranes of the brain) or brain abscess, hearing loss, venous thrombosis, vasculitis etc., are well known-though rarely occurring complications of meningitis and they should also be treated. These strong medicines at times can cause side effects and therefore they should be taken carefully.

### **3. Fungal Meningitis :**

The fungal infection in the brain is called fungal meningitis. There are many types of fungus like Cryptococcus, Coccidiosis, Candida, Aspergillus, Histoplasma etc. The C.S.F. report is similar to that of tubercular meningitis, but on close microscopic examination fungus is found. (e.g. India Ink Preparation in Cryptococcus). This disease starts with low grade fever, headache, weakness, anxiety and therefore, initially it is not diagnosed and the disease advances in the absence of proper treatment leading to unconsciousness and seizures etc.

Usually, fungal diseases occur in patients whose immunity is low, like in cases of cancer, lymphoma, AIDS, drug addiction, alcohol abuse, excessive intake of antibiotic

medicines, herpes, chemotherapy for cancer, uncontrolled diabetes, the fungus starts spreading in the body, including brain, very fast.

Sometimes the patient may go to the hospital for the treatment of some other disease and may end up infecting himself with TB, fungus or other pyogenic diseases. This is a major draw-back of the modern medical system.

For fungus, drugs like amphotericin, flucytosine, sparnox etc. are used. These medicines have severe side effects on the kidney, liver, ears etc and thus should be administered carefully.

#### **4. Viral Encephalitis :**

This is an extremely fast spreading disease in which the patient gets fever, headache, sudden behavioural changes, depression, photophobia... and then gradually seizures or paralysis or loss of consciousness. This disease quickly damages the cells of the brain and many times leaves residual damage in the body, like memory loss, seizures or behavioral changes.

If mumps virus, herpes simplex virus, (HSV-1) arbovirus and sometimes, varicella, Epstein B arr, enterovirus enter the brain for any reason, they can cause viral encephalitis. The AIDS virus can also cause encephalitis. Sometimes, the virus affects only the membranes of the brain causing viral meningitis, which is not a very serious disease in comparison.

Such viral diseases can be extremely dangerous, like in the USA 10 to 40% of the patients suffering from Herpes encephalitis die. And the same percentage suffers from the disabilities mentioned earlier.

**Diagnosis :**

CSF report shows increase in protein levels, sugar is almost normal and lymphocytes are more. Immunological tests like CSF-HSV test or sometimes CSF-PCR test can confirm the presence of virus.

If required, in certain cases M.R.I or C.T.Scan or E.E.G. may be done.

If the disease is diagnosed in the initial stage, immediate treatment can save life and disabilities, e.g. in Herpes Encephalitis, acyclovir (zovirax, vir) injections are used. Like all medicines, the doctor determines the exact dosage and the duration of the medicine. There are not many side effects of this medicine, but caution should still be exercised.

Besides this, virus like C.M.V. and many other such viruses can affect the brain in one way or the other which are not mentioned here due to the lack of space. Similarly, there are some other viruses affecting the brain, they are called slow virus, and they destroy the brain cells slowly, in months and years. They are S.S.P.E. (Subacute Sclerosing Pan Encephalitis), Creutzfeldt Jakob etc. Unfortunately no medicines are available for these. Medicines which are available are hardly effective and in most of the cases the patient is pushed to the brink of death.

**5. Falciparum Malaria :**

Malarial organisms are a part of the micro-organisms, but they are completely different from the virus and bacteria and belong to protozoa group.- These organisms are known as malarial parasites. There are basically four types of malarial parasites, but the main are vivax and falciparum. Before we discuss falciparum, we will study this widespread disease in detail.

**The Life Cycle of the Malarial Parasite is considered into Two Stages :**

1. The first cycle occurs in female anopheles mosquito. This part of the cycle is known as the reproductive stage.
2. The second part of-the cycle takes place in the cells of the human liver and in the red blood cells. This can be called the stage of development, division and growth.

When the Anopheles female mosquito bites a human, along with the sting the sporozoites of the malarial parasite enter the blood stream and within a short period enter the liver cells. Here their development, division and growth take place. Ultimately, the cells of the liver rupture and innumerable merozoites enter blood and then enter the red blood corpuscles. In this stage some of the merozoites get converted into gametocytes (Male and female). Gametocytes represent the stage of gametogeny. i.e. reproduction.

When a female Anopheles mosquito bites a malarial patient and sucks the blood, gametocytes also reach the stomach of the mosquito and there, in the stomach new sporozoites develop, which enter the blood stream of another person through the sting of the mosquito. The rest of the merozoites, which are present in the blood cells continue with the process of development, division and growth. Eventually, these red cells also rupture and innumerable merozoites are released in the blood stream and enter other red cells. In vivax malaria, this process continues for a long time. The falciparum malarial parasite goes through only one cycle in the human body.

The fever and shivering occurs primarily because of the rupture of innumerable blood cells. This is also the cause of anemia (pallor or decrease in the hemoglobin levels) after frequent bouts of malaria.

Thus, malarial parasites continue their life cycle in female anopheles mosquito and humans and keep the disease as well as themselves alive. The symptoms of the disease occur only after 8 to 14 days of the mosquito bite.

### **Symptoms of Malaria :**

#### **Malarial attack occurs in three stages:**

1. In the initial phase, the patient experiences shivering.
2. Once the shivering stops, the body temperature rises (fever) and the patient feels warm.
3. After some time the patient perspires profusely and the fever subsides. The patient experiences extreme weakness.

The attack occurs again in a similar manner on the second or third day.

In addition to this headache, body ache, nausea, vomiting and dry cough may occur. In many cases boils erupt on the lips (herpes simplex, labialis).

*Falciparum malaria* can occur with many other unusual symptoms. These malarial parasites infect all the stages of the red blood corpuscles (*Vivax* infects only the newly formed blood cells) 1 to 2% of the total blood cells get infected. Thus the number of infected blood cells is considerably more and the resulting anemia is also more severe. These infected blood cells clog the capillaries causing unconsciousness (Cerebral malaria). Kidney disorders,

diarrhoea, jaundice, respiratory problems, low blood pressure etc life threatening problems may also occur.

Usually, tablets of chloroquin are used in the cases of vivax malaria. Quinine is a very effective medicine for falciparum malaria. This is given in a dose of 10 mg/kg every 8 hours for 10 days. There are many side effects of the medicine, especially on the heart. Therefore, this drug should be taken under the supervision of a doctor. In serious cases, quinine is given intravenously along with glucose. When the patient is able to take the tablets orally, then the same is administered accordingly.

Sometimes this drug is not effective in falciparum malaria. For such drug resistant cases mefloquin, artesunate, artemether etc. are given. Besides this pyrimethamine, tetracycline, doxycycline can also be given in less serious cases.

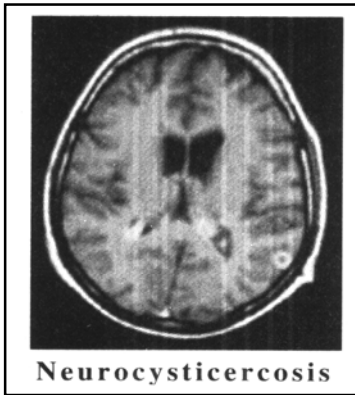
### **Blood Test for Confirmation of Diagnosis :**

If the required blood test is carried out carefully, malarial parasites are normally seen in the blood cells in a peripheral smear. In falciparum malaria, the proportion of malarial parasite being more they can be seen very easily in the blood test, but in vivax type of malaria the numbers being less, many times they cannot be seen. The test called Q.B.C gives more accurate results. It is better to collect the blood sample when the patient has fever, but this can also be done later. Many a times the blood tests are negative in a patient who has self medicated himself and has taken 2 to 4 tablets of chloroquin. The doctor has to treat the patient solely on the basis of the symptoms or repeat Q.B.C. 3times every 8 hourly.



If the symptoms point more towards malaria, the treatment should be completed. If the fever is not cured even then, further investigations should be done to find out the exact cause and treatment given accordingly.

## 6. Neurocysticercosis :



This is one of the widely known and perplexing parasitic diseases of the brain where the CT scan shows ring enhancing lesions like TB in the brain. It is said that in our country the main reason for the seizures in younger generation is the infection of a parasite named cysticercus, which occurs due to eating meat or unwashed

salads. In this case along with the medicines to control the seizures, **albendazole** or **praziquantel** are also given in a proper dose by the neurologist. Avoiding meat and salads or if possible eating after washing properly and heating at low temperature can help avoid this disease.

## 7. Tetanus :

This disease occurs due to the toxin produced by a gram positive organism known as clostridium tetani. This organism enters our body through wounds.

This poisonous chemical (exotoxin) excites the muscles and the nerves causing tetanus. The muscles get spasms; there is difficulty in opening the jaws (lockjaw). Along with this, arching of the muscles of the neck, back and chin occurs. Initially, the problem is less and gradually within

hours or days, the muscles are continuously excited and the patient starts getting spasms. Finally, it starts affecting the respiratory system and the swallowing muscles and seizures also start. Sometimes when the tetanus limits itself to the wounds, the chances of recovery are more, but in the full blown cases of tetanus, the death rate is around 60% despite treatment.

### **Treatment :**

The treatment begins by giving Hyper Immune Globulin (3000 to 10000 units). The wound is properly cleaned and a surgical dressing is done. Penicillin is the most reliable antibiotic for tetanus, which is given for 10 to 14 days. If the patient is allergic to penicillin, he is given tetracycline.

The patient is kept in a dark room and diazepam is given intravenously in proper dose to prevent seizures and spasms. Sometimes, neuromuscular blocking is done after keeping the patient on a ventilator. There can be problems like irregular blood pressure, fever, or heart trouble due to the irregularities of the involuntary nervous system, which also have to be treated carefully. Prevention is always better than cure.

### **Vaccination :**

Anyone above the age of two months or who has not been vaccinated systematically or who has recovered recently from tetanus, should be given the tetanus toxin (TT) vaccination. The second dose of TT injection is given after one month after the first dose; and the third dose is administered after six month. After every 10 years a booster dose of TT needs to be taken. Pregnant women are given extra doses of TT. In this way the entire course of TT needs

to be taken, which gives immunity against tetanus. When a person suffers from an injury he is given a dose of TT again and if the wound is dirty then the patient should be given a dose of human tetanus immunoglobulin (250 units/I.M). These are the general guidelines for the prevention of tetanus because every individual/case has different factors and thus it is for the doctor to decide the treatment for each individual case. This disease is unfortunately still prevalent in our country because of poor hygiene, illiteracy and ignorance. The lack of cleanliness and proper medical services in the villages, thousands of lives, to such a preventable disease.

### **8. Poliomyelitis :**

This viral infection of the brain is caused by enterovirus and damages the anterior horn cell of the brain and the spinal cord, which results in handicap. There is sudden fever accompanied by paralysis. Fortunately, rigorous vaccination drives have nearly eradicated this disease from the face of the earth. The treatment is basically supportive and there is no specific treatment available. Avoiding intramuscular injections to small children during fever can prevent many polio cases.

### **9. Rabies :**

Rabies is a dangerous viral disease affecting the brain, which is contracted by the bite of any warm-blooded animal like a dog, monkey, fox etc. and results in definite death. This disease can occur anytime between 30 to 60 days or even after 6 months of animal bite. In the initial stage there are certain behavioral changes and the patient stays excited and then he may suffer from paralysis etc. The main

symptom is phobia of water and in a short period death occurs either due to respiratory failure or ceasing of the heart beats. Even the best treatment can rarely save a patient. Therefore prevention is very important. It is advisable that rabies vaccine and anti-serum be used in each and every case of animal bite. The older vaccine has some side effects and therefore newly discovered refined vaccines called HDCV (which are a little costlier) are preferable. In such matters it is important to consult a doctor immediately.

### **Summary :**

The discussion on various infectious diseases of the brain demonstrates that the infectious diseases of the body and the brain occur due to weakened immunity poor and therefore it is necessary to boost the immune system. An appropriate nutritional diet, with, adequate fruit and vegetable consumption, exercise, cleanliness, drinking boiled water etc. are very essential for improving the immune system.

In addition to that, if there is a patient suffering from these infections in the office or at home one should be very careful. The doctors sometimes prescribe an antibiotic or some other medicine to the relatives of such a patient in order to avoid the disease; such medicines should be . religiously taken. Over exertion and mental stress should be avoided. Also, intake of unhygienic and non-nutritious food and beverages should be avoided. In the following chapter we will learn how to prevent AIDS.

Finally, boosting up the immune system should be the main aim. It is said, “Prevention is better than cure”.



# 12

## AIDS AND THE NERVOUS SYSTEM

AIDS means Acquired Immuno-Deficiency Syndrome that occurs due to HIV i.e. Human Immuno-Deficiency virus. It affects the immune system of the body, causing many problems. AIDS is not just a single disease, it points towards a group of diseases.

Normally, our body has two types of mechanisms to **fight against infections**.

1. Cell mediated immunity -provided by the Lymphocytes
2. Humoral immunity - conferred by the antibodies.

HIV hampers the functioning of the T-lymphocytes by infecting them as well as decreasing their numbers. Due to the dwindling of these cells, which are the most important defence mechanism of the body, the entire immune system of the body gets affected and the immunity power of the body gradually decreases. Because of this, the organisms, which cannot infect a healthy normal person, are easily able to infect a person suffering from AIDS.

### **How the AIDS spreads?**

1. By heterosexual or homosexual intercourse. 2. Transfusion of the blood of an AIDS patient to a normal person.
3. Mothers suffering from HIV can transmit the disease to her fetus during pregnancy in 30 to 40% of the cases.
4. By the needle of the injection, syringe and other operative instruments.

5. If a normal person uses a needle used by an AIDS person, addicted to intravenous drug abuse, the infection can easily spread.

There are many misconceptions that are still prevalent in our society regarding AIDS. For example, AIDS can be transmitted by staying with a patient, shaking hands, playing, eating etc. All these notions are only myths. It is very necessary that an AIDS patient is not isolated but socially accepted with warmth.

### **Tips for prevention of AIDS**

1. Disposable syringes and needles should be used for injections and injections should be avoided for common diseases unless absolutely essential.
- 2: Don't have sexual relations with a stranger.
3. If blood transfusion is required the blood should be used only after testing the blood for HIV in a laboratory. If possible take blood only from family members and relatives. Don't take blood from professional blood donors.
4. Use individual razors and blade and avoid sharing.

### **Symptoms of AIDS :**

1. The first illness occurs within 6 to 8 weeks. The patient gets fever, muscular pain, swelling of lymph glands, red spots on the skin, swelling in the throat etc. The patient is cured without any treatment in a week. This first illness is called as sero conversion illness. After this first illness HIV test is positive. In the initial 6 to 8 weeks the laboratory test is negative but the patient can still spread AIDS during this phase. This phase is called Window period.

2. After the first illness, the patient enters the non-symptomatic HIV carrier phase. This phase can last up to 5 to 10 years. This period is dependent on the overall health and habits of the patient.
3. After this phase various symptoms are seen like swelling of the lymph glands, continuous or frequent fever, ulceration in the mouth and throat, splenomegaly, prolonged coughing, weight loss etc. If these symptoms prevail for a long period of time or recur frequently, diagnosis can be confirmed by getting the blood tested for HIV. If the **ELISA test** for HIV is positive, this test is repeated once again and if this too is positive, the findings are confirmed with an investigation called western blot test The diagnosis can also be confirmed by P.C.R. test, virus load etc. **CD<sub>4</sub>** count helps to determine the strength of the immune system of the body. If the count is less than 100, it is assumed that the patient is near death.

**The main symptoms of HIV as defined by the World Health Organization : “WHO”**

1. Fever for over a month
2. Diarrhoea for over a month and weight loss of more than 10%.
3. Coughing, itching in the body, ulceration in the mouth, throat or private parts of the body, swelling of the lymph glands in two or three parts of the body, frequent attacks of herpes zoster, signal a HIV test to be done.

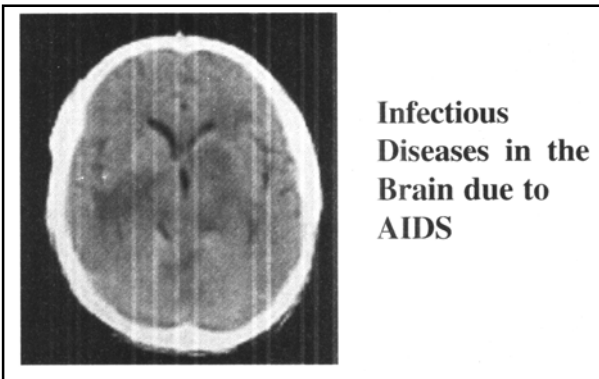
Various neurological symptoms related to the brain and nervous systems are found in AIDS. It is said that 33% of the patients suffering from AIDS have an overt neurological

disorder, while actually the brain and nerve tissues are more or less damaged in every AIDS patient.

**Laboratory Investigations: /Pathological tests :**

The presence of the HIV organisms in the body is detected with the help of ELISA test. This test is a screening test and if it is positive, confirmation is done with the help of Western Blot test. After infection, one is able to detect the presence of HIV in a period of 6 weeks to 6 months through these tests. But during the window period this test can be negative or indeterminate results. The number of viruses present in the body and CD<sub>4</sub> count can also be determined through various tests, which is helpful for the treatment.

**The diseases of the brain and the nervous system related to AIDS are divided into five parts :**



1. Brain encephalitis, herpes simplex, varicella zoster, AIDS dementia complex (memory disorder), diseases of the metabolism of the brain, TB of the brain, lymphoma, toxoplasmosis, P.M.L, abscess, syphilis of the brain, fungal infection of the brain etc. can cause extensive damage, by direct infection of brain.



2. Edema of the spinal cord called myelitis, myelopathy etc. can occur, which can hamper the movements of the patient.
3. Infections in the membranes of the brain (meningitis) resulting in meningitis. These infections can be due to organisms of TB, syphilis, fungus, and can cause unconsciousness, seizures or paralysis.
4. Damage to the nerves of the nervous system result in neuritis caused by infectious organisms like Herpes etc. This may result in burning sensation in the legs, walking disability, pain etc.
5. Polymyositis and other such muscle related diseases in which the muscles become weak.

Therefore, AIDS can cause disorders in organs ranging from the lymph glands to neurological system, though diseases related to the heart are seen in less proportion in AIDS patients.

### **Treatment :**

The treatment of AIDS is usually long term and very expensive. Still the treatment, which can cure AIDS completely, has not yet been discovered. With the present medicines and the treatment it is only possible to stop the spread of the disease as well as improve the immune system (CD<sub>4</sub> count) to some extent. As a result the quality of the patients life can be improved, the infectious diseases can be prevented and the patient can move around and can remain mentally sound.

The medicines available to kill the AIDS virus are very expensive. Many a times the doctors use a combination of three medicines whose average monthly expense is around Rs. 10,000/-. The irony is that in spite of this expenditure, the disease is neither completely cured nor controlled.

It is to be remembered that the infection of HIV is not the primary cause of death. The AIDS patient dies mainly because of the infections of microorganisms and infectious agents. Therefore, if the diagnosis of these organisms is done in an early stage and treated immediately these infections can be cured. However, treatment of AIDS is now more or less a separate medical sub-speciality and for all further details an AIDS specialist should be consulted.

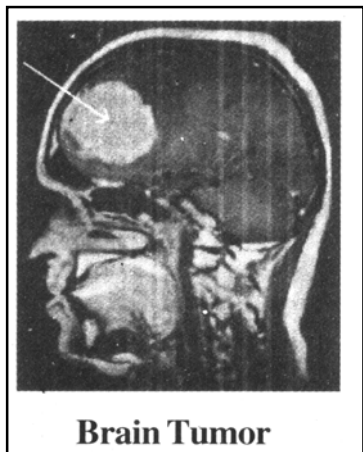
In short, early diagnosis, appropriate treatment, a healthy lifestyle which prevents infections and infectious diseases, can improve the life and the quality of life of the patient of AIDS.



# 13

## BRAIN TUMOURS

Brain tumor is an extremely serious neurological disease and it is very important to know about it. There are various types of brain tumors. They cause various common and specific symptoms depending on their size, type, location, properties and histology. Some tumors destroy the brain and some increase the pressure on the brain. Tumors are one of the main reasons of raised intracranial pressure. Improvement in the surgical techniques and anesthesia, developments in stereo tactic and the micro neurological techniques, remarkable advances in radiation as well as chemotherapy have brightened the future of patients of brain tumors.



Brain tumor is a well-known disease and in a highly developed country like USA approximately 1 lakh people die per year due to it, so the plight of our country is unimaginable. Out of these many, are cases of cancer -that originate in the brain (primary) like glioma or spread from other parts of the body to the brain. (secondary). Rest of the tumors are relatively benign

like meningioma, pituitary tumor etc. Tumors occurring due to infectious diseases like tuberculoma, abscess, cysticercosis, AIDS etc. also need to be mentioned, though they have different symptoms, diagnosis and treatments.

## **Symptoms :**

The symptoms of brain tumors worsen gradually, depending upon the quality, location, size, and type of tumor as well as the severity of the accompanying edema.

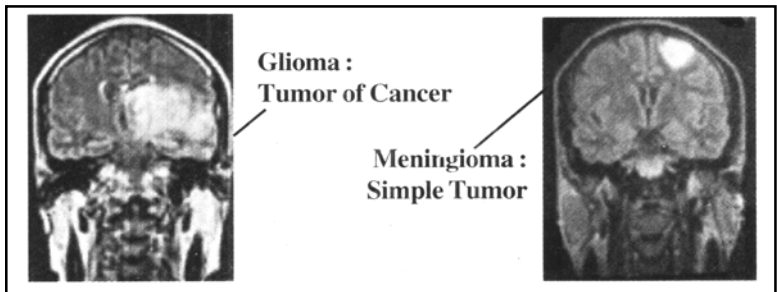
1. **Increased Intracranial pressure:** Increase in the size of the tumor increases the pressure inside the skull (a fixed vault) as well as on the brain, causing symptoms like headache on both sides, nausea-vomiting, blackouts, uneasiness and diplopia. All cases of headache do not indicate brain tumor, only in 1 % of the cases, the cause of headache is brain tumor. But if a healthy individual starts experiencing headaches of increasing intensity, it is essential to get examined by a specialist.
2. The symptoms of brain tumor depend upon the location of the tumor. Therefore there can be a gradual increase of paralysis, speech loss, memory loss or lack of body co-ordination. In some patients there is only a behavioural or a personality change, or loss of bowel or bladder control :
3. Seizures or unconsciousness can also be an important symptom especially if it is accompanied by headache or paralysis; if so immediate investigations are necessary.
4. Sometimes a je,prriage in the tumor can create an emergency situation for the patient. Usually, only if there is more than one of the above symptoms, the possibility of a brain tumor in the patient is high.

## **Diagnosis :**

In most of the cases the following investigations are done to confirm diagnosis of tumor.

1. **CT Scan Brain (with contrast):** This is a complete investigation in itself, but if the tumor is small or is present at the posterior of the brain or the type of the tumor cannot be confirmed on a CT Scan, MRI is required.
2. **MRI (Magnetic Resonance Imaging)** can be done for confirmation and is in fact essential in some cases. For accurate diagnosis, sometimes angiography is also needed. If a person has a pace maker or a metal implant in the body MRI cannot be done and in such cases diagnosis has to be based only on CT Scan. Some patients find it difficult to sleep in the MRI chamber for 20 to 30 minutes (**claustrophobia**). In this condition as well as in small children a sedative or low dose of anesthesia is given and the investigation is carried out.
3. **Lumbar puncture:** Lumbar puncture is done for the investigation of the cerebrospinal fluid. But if the edema in the brain is high this investigation can be dangerous. Therefore in the cases of brain tumor, there is very little scope for this investigation. This investigation is very useful in the diagnosis of the infectious diseases of the brain like meningitis, encephalitis etc.

### Types of brain tumors :



As mentioned earlier, there are two types of brain tumors, cancerous and the benign (non-cancerous). The brain tumor in the upper part of the brain is called supratentorial. The tumor in the posterior or inferior part of the brain is called infratentorial. These two kinds of cancerous and benign tumors also occur in the spinal cord.

Some cancerous tumors grow very rapidly and are serious, in which the patient's life span is only six months to 3 years e.g. malignant glioma (Anaplastic glioma, glioblastoma multiforme etc....), whereas some cancerous tumors spread slowly like Astrocytoma, Oligodendroglioma etc.

Apart from this there are tumors of lymphoma kind in the brain, which are found mostly in the patients suffering from AIDS.

The main benign tumors are meningioma, schwannoma and the tumors of the pituitary glands. If these are diagnosed in early stages and operated upon by a capable surgeon the life of the patient can be saved. Not only this, the patient can lead a near normal life, apart from some minor problems and weakness. At the most he may have to take drugs for prevention of seizures for the rest of his life. If the cancer spreads from any other part of the body to the brain, it is known as metastatic tumor. Sometimes it so happens, that the symptoms of brain tumor may point out the presence of cancer in some other part of the body, but it is too late by then. Locating the primary cancer and treating it may increase the life span of the patient.

### **Treatment :**

The role of a neurosurgeon is more important in the treatment of a brain tumor than a neurologist. If the tumor is

cancerous, the services of an oncologist and radiation physician are also very important. After surgery and other treatments the remaining symptoms like seizures, swelling, paralysis etc. can be attended to from time to time by a neurologist.

There is so much advancement in the treatment of brain tumors that some types of tumors can be stopped from growing, and eventually shrunk by the use of gamma radiation, without opening the brain. If this fails, only then the conventional surgery needs to be done. Many small and superficial tumors can be removed through stereotaxis technique, in which they can be sucked out through a special needle or in some cases, it can be dissolved or cauterized with the help of particular rays. In other cases, the surgeons remove the tumor by opening the brain and spinal cord. Sometimes, intricate surgeries can be performed with the help of a microscope, which do not affect the normal parts of the brain. Due to this the brain operations can go on for six to twelve hours. The advances in anesthesia have helped in reducing the risk of surgery. Fortunately, there are experienced surgeons, good anesthesiologist and excellent techniques available at various places in India and abroad.

After surgery, physiotherapy and necessary medicines are given to cure the symptoms and side effects. If the biopsy of the tumor shows malignancy, chemotherapy, radiation etc are used to try to cure the patient.

The brain tumor is undeniably a serious disease, but majority of non-malignant cases can be cured. For this it is necessary to recognize the early symptoms and analyze them and getting the problem diagnosed and treated by a specialist at the earliest. There is no need to be panicky, about it.



About two out of every thousand children suffer from cerebral palsy. It is a congenital disease of the brain, in which the development of either both lower limbs or both upper and lower limbs is very slow, along with a degree of mental retardation and seizures, emanating from brain, therefore this disease is called cerebral palsy.

Thus cerebral palsy literally means – damage to the developing brain, as discussed in previous chapters. Different mental and physical activities are controlled by specific portions of the brain. Mental or physical disabilities including speech, memory, and learning defects relate to the part of the brain damaged. Hence, patients of cerebral palsy may have one or more disabilities and two patients with cerebral palsy may have totally different symptoms.

The unique characteristic of this disease is that it gets better with advancement of age. The disease does not progress further. Thus if the disease is progressing and worsening, over a period of time it cannot be cerebral palsy.

#### **Causes :**

In some cases, cerebral palsy occurs due to oxygen deficiency during birth. In majority of the cases it occurs during pregnancy due to the environment in the womb or defects in development of the fetus. It is occasionally genetic.

As we have seen cerebral palsy results from brain damage, the causes are as follows:



**(A) Prenatal (before birth)**

1. Premature delivery.
2. Viral infection to the mother during pregnancy.
3. Rh -Bloodgroup incompatibility.
4. Hereditary diseases.
5. Maternal diseases during pregnancy, problems of fetal development.

**(B) Perinatal (during birth)**

1. Prolonged labour or abnormality of fetal heart rate.
2. Injury to the baby's scalp during delivery.
3. Umbilical cord around the baby's neck leading to the brain damage during labour.

**(C) Postnatal (after birth)**

1. Seizures
2. Pathological jaundice
3. Hypoglycemia.
4. Infection - septicemia .
5. Hypocalcemia.
6. Edema in the brain.
7. Meningitis, encephalitis.

Hence if required, incubator care should be made available for the newborn. However, it is not possible to define a cause in every patient. Many of these causes are preventable, for this, public awareness is a must.

**Types of Cerebral Palsy :****1. Spastic Cerebral Palsy :**

This is the commonest type of Cerebral Palsy. The muscles remain tense and spastic and hence the affected

limbs are difficult to stretch. Legs are crossed (scissored). The child tends to walk on toes. Depending on the part of the body affected, the sub-types are :

- A. **Hemiplegia** : When one half of the body, i.e. hand, leg and half of the trunk are affected.
  - B. **Diplegia** : Both the lower limbs are weak. There may be some weakness in the hands.
  - C. **Quadruplegia** : When both hands and legs as well as trunk muscles are affected.
2. **Dyskinetic : (Dystonic, athetoid) Cerebral Palsy** : Involuntary movements in different parts of the body, make it difficult for the patient to carry out intentional activities.
3. **Ataxic Cerebral Palsy and Hypotonic Cerebral Palsy**: The patient finds it difficult to maintain balance. The muscles are flabby (hypotonic).
- C.P. children may have one or more of the above mentioned features. Besides, following features may co-exist
- (A) Squint in 50%-60% children
  - (B) Visual problem including field defect
  - (C) Epilepsy - 66%
4. **Hearing impairment**
5. **Mental retardation 66%**
6. **Stubbornness, hyperactivity**

#### **General Information :**

Cerebral Palsy may not necessarily be harmful for every child and it is not that improvement is not possible. In many

children if the problem is minor, the patient can recover fast. In other cases extensive exercise (physiotherapy), along with appropriate drugs may offer little results after a long period of treatment. 30% patients may suffer from a severe form of this disease where the possibility of complete recovery is less.

In the first month after the birth the child may appear normal but gradually it is seen that the development is very slow, becomes slow or the child is never able to learn to sit by himself. A normal child learns to walk in the first year, which is delayed due to this disease, and even if the child learns to walk he tries to stand on his toes and walking is very difficult.

Similarly, development of the brain and intelligence is low in most of these children. In addition to that they learn to speak very late and the pronunciations are not clear. In severe cases, mental retardation can be judged from the face of the child. Many children among these can be hyperactive and may suffer from seizures. Though one must not forget that in some children the disease may be very mild and the child may recover in due course of time, in cases where all the limbs are affected, there is considerable damage to the brain, and the IQ level of the child is low; the treatment is really difficult.

### **Diagnosis :**

Cerebral Palsy can generally be diagnosed through physical examination of a child itself. In a few cases it becomes necessary to take the help of tests like MRI. The history about the delivery of the child like difficult

delivery, respiratory trouble in the newborn, late crying, or the baby turned blue after birth etc. can be very helpful in diagnosis.

**Treatment :**

There is no magical remedy or a surgery for cases of cerebral palsy. However, one should not be discouraged with this fact. One has to accept the reality and start special training from the day of diagnosis. Early diagnosis is a must. The training given to small children below age of 5 years, is called early intervention. Considering the exact damage to the child, combination therapy of following different therapists is advocated.

- 1 Developmental physiotherapist.
- 2 Child physiotherapist.
- 3 Speech therapist and audiologist.
- 4 Occupational therapist.
- 5 Special teacher.
- 6 Additionally, an orthopedic surgeon, eye specialist and neurologist as and when required. Tizanidine, Dantrolene are also used.
- 7 In selected cases, some minor-major surgery is also offered to lengthen or strengthen the limb etc.

Thus the aim of this training and treatment is

- Independence in the, daily living/activities
- Social acceptance
- Educational achievement
- Economical independence i.e. self earning.

**Summary :**

About 33% of C.P. children have relatively normal I.Q. They can attend normal school Rest of them need special training.

It is ironical that the birth of such a child is considered nature's curse. The child is a big responsibility and problem for the society and family. In spite of so much advancement in the field of medical science such cases can neither be prevented nor treated properly. Thus it is our social, moral and humane duty to financially support physiotherapy centers and institutions treating and training these children. One must also think of starting such new institutions or spare some time for development of these children and give warmth and support.

**Prevention :**

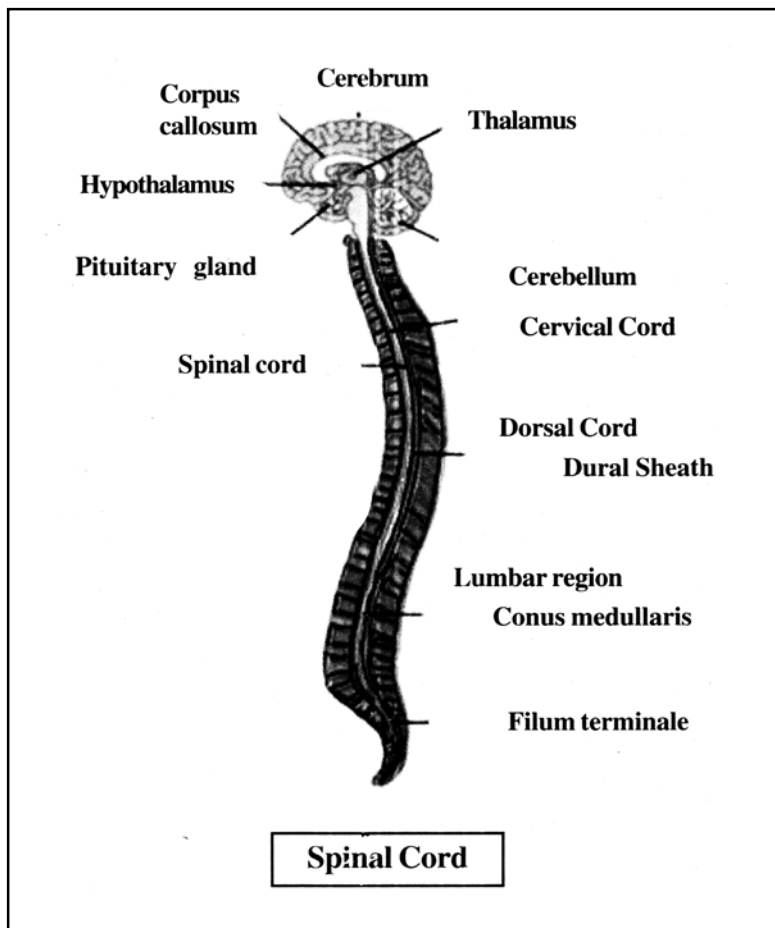
Most important is to help create public awareness regarding care of a pregnant woman, need for regular antenatal checking with a gynecologist, importance of fetal Sonography and compulsion for a delivery under a specialist observation in an equipped maternity centre. These measures can prevent large number of cases of cerebral palsy.



# 15

## DISEASES OF THE SPINAL CORD - MYELOPATHY

Till now we have discussed about the diseases related to the brain. Now before going ahead with the diseases of the nerves and the muscular system, we will discuss the diseases of the spinal cord in brief.



The **spinal cord** is the relay station of the messages going in and out of the brain to and fro from the nerves and muscles. Encased safely within the vertebrae of the vertebral column the spinal cord is a very important organ of the nervous system. There are over 30 types of diseases that can occur in the spinal cord which can be understood in terms of the working and the structure of the spinal cord, its function of carrying the messages, its length, its cylindrical shape, its small width, its membranes, its blood vessels, its relation with the vertebrae etc....

### **Symptoms of the diseases of the spinal cord :**

- Weakness or paralysis of the lower limbs.
- Tingling sensation in the entire leg.
- Weakness in all the four limbs.
- Retention of urine and/or stool or loss of bladder or bowel control.
- Continuous pain in any part of the hands or legs.
- The patient may remain unaware even if his footwear comes off (loss of sensation) or a feeling of cushioning of the feet, burning sensation, sensation of ants crawling over the legs or hands.
- The wasting of the muscles of hands and legs, etc.

The symptoms of spinal cord diseases are mainly seen as a **syndrome** and are very obvious, hence the diagnosis is usually clear. These diseases are known as **Myelopathy**.

If there is damage in the part of the spinal cord situated between the cervical vertebrae, it is known as **cervical myelopathy** in which the normal movements as well as the sensations of the legs and hands get hampered. If there is

any damage to the part of the spinal cord situated between the thoracic vertebrae, only the movement and sensations of one or both of the legs are affected. There may be problems in bowel and bladder movements. This is known as **Dorsal Myelopathy**.

**Important Points :**

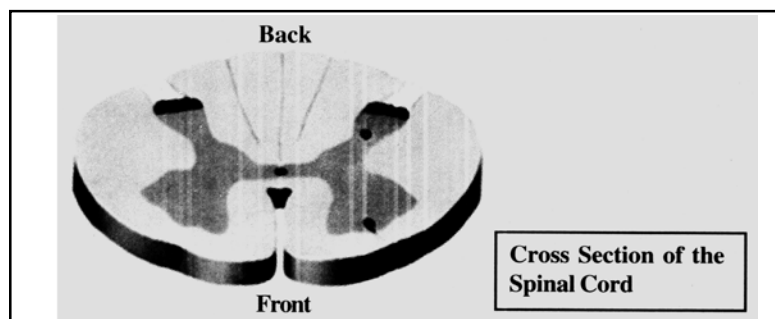
1. The spinal cord is usually not found in the lumbar vertebrae, that is, the spinal cord ends at the first lumbar L<sub>1</sub> vertebra. This is known as conus medullaris. From here it gets transformed into the nerves known as Cauda Equina (like the tail of a horse).
2. In the diseases affecting only the spinal cord, there are no symptoms related to the brain like speech defects, ability to understand, sensations of eyes, ears, nose, seizures, one sided paralysis or facial paralysis, etc. If the above-mentioned symptoms are present, the disease is of some other origin and not purely of spinal cord.
3. **Syndromes (symptom complex) of spinal cord disorders :**
  - I. All the sensation in the spinal cord being cut off below a certain level, with loss of movements of both legs, retention of stool and urine may occur e.g. **a vertebral fracture** in a road accident.
  - II. The working of certain sensory nerves gets disturbed and its motor functioning decreases along with pain in the nerve. (**Myelo-Radiculopathy**) like spondylosis.
  - III. The functioning of the half side of the spinal cord is affected. (**Brown Sequard**). This causes loss of movement of the leg on one side, while the sensation of the other leg gets hampered.



- IV. The front part of the spinal cord stops functioning below a level suddenly (e.g. clot in a blood vessel).
- V. Compression of the uppermost part of the spinal cord. (Foramen Magnum Compression).
- VI. Syringomyelia: The middle portion of the spinal cord becomes hollow and fills with fluid resulting in the atrophy of the nerves of the hands with bladder dysfunction.
- VII. Conus Medullaris syndrome: A tumor or compression at the lowermost part of the spinal cord. i.e. L<sub>1</sub>
- VIII. Cauda Equina Syndrome: The disease of the group of nerves coming out from the end of spinal cord.

Thus, the spinal cord diseases can be simply divided into two parts :

- 1. Compressive Myelopathy: Diseases caused by the pressure on the spinal cord due to a tumor, pus, fracture etc.
- 2. The diseases not caused by the pressure on the spinal cord (Noncompressive Myelopathy): which includes infection in the spinal cord, vitamin deficiency, edema, degeneration, ill effects of chemicals, medicines etc.
- 3. In such cases MRI, myelography, lumbar puncture etc. can help for accurate diagnosis.

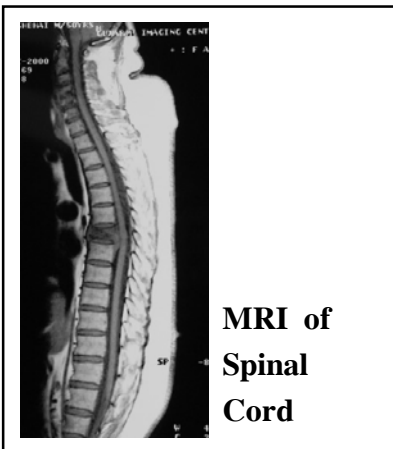


Now let's discuss the compression of the spinal cord.

1. The diseases, in which there is a tumor or accumulation of fluid in the center of the spinal cord, are called intramedullary diseases of the spinal cord, which can be detected quickly with the help of neurological examination and can be confirmed through MRI.
2. The tumor of the membranes of the spinal cord (Meningioma) or the tumor of the nerves coming out of the spinal cord (Schwannoma).
3. Cancer of the membranes of the spinal cord or lymphoma.
4. Tumor of the external membranes of the spinal cord.
5. Fracture of vertebrae, bone tumor, cervical spondylosis, abscess in the vertebra e.g. TB, dislocation of vertebral disc, degeneration of the cord due to fluorosis.

All these causes put pressure on the spinal cord, which can be seen in the diagram below.

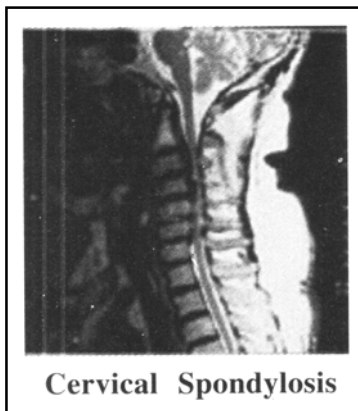
### **MRI of the Spinal Cord :**



Among all these cases, injury to the spinal cord due to vehicle-accidents is very common, and many times the treatment for the same is difficult. Symptoms of pressure on the spinal cord and the nerves due to cervical spondylosis are also common, in which surgery may also be required. It is mostly found in adults.

### **Cervical Spondylosis :**

With aging, degenerative change occurs in the bones of the vertebral column.' This results in an inflammatory process. This process results in osteophyte (tags of bones) formation. Degenerative changes occur in the disc between two vertebrae. The gelatin in the disc oozes out which in turn causes compression over the spinal cord leading to various complex symptoms.



**Cervical Spondylosis**

If the spinal cord is directly compressed, it is known as myelopathy. Cervical spondylosis is now common. Compression over the C 5-6 or C 4-5 segments results in cervical myelopathy. Similarly dorsal myelopathy may occur.

If the nerve roots or nerves are compressed, it may lead to radiculopathy. The patient complains of burning or tingling and, the sensations in the corresponding parts may be decreased (sensory radiculopathy). The muscles supplied by the particular nerves may become weak resulting in difficulty in particular actions (motor radiculopathy).

Spinal cord does not extend in to the lumbar part of spinal canal. Hence, compression in this region affects the nerves resulting in radiculopathy or cauda equina syndrome. In some cases, pain in the neck or back is the only symptom. But this pain can be very distressing.

Appropriate test can give specific diagnosis. The main test is M.R.I. If upon clinical examination, more than one

level of compression are found, the patient may have to undergo M.R.I. of the whole spine (eg. cervical and lumbar spondylosis coexisting).

As spondylosis mainly occurs due to aging and degenerative changes, it is difficult to check the process. Few tips may be helpful. The patient should avoid moving the neck with a jerk, avoid lifting weight on the head and should wear a cervical collar so as to restrict neck movements.

When the compression over the nerves and spinal cord increases, pain killer drugs, simple exercise or if required tractions are advised. Some experienced doctors use steroids, though very cautiously. In' appropriate cases, surgery has good results including relief from symptoms of myelopathy and radiculopathy (viz. pain, difficulty in walking).

The rest of the diseases of the spinal cord are known as **Noncompressive myelopathy**, which can occur due to many reasons. The main causes are as follows:

1. The different types of viral infections of the spinal cord including herpes, rabies and AIDS.
2. Other infectious diseases like TB, fungus, abscess, syphilis, etc.
3. Other inflammations of the spinal cord e.g.
  - The working of the spinal cord can be hampered by the side effect of the antirabies vaccine
  - Multiple sclerosis (demylinating disease) • Collagen diseases of spinal cord
  - Inflammation of the spinal cord caused by malignancy of any other part of the body
  - Damage in the spinal cord due to radiation.

Above mentioned three conditions are known as Myelitis i.e. inflammation of the spinal cord.

4. Severing of the blood supply to the spinal cord 5: Hemorrhage in the spinal cord, e.g. rupture of an aneurysm
6. Damage to the spinal cord due to deficiency of vitamin B<sub>12</sub> or Folic acid
7. Toxic myelopathy caused by the ingestion of toxic foods, drugs or chemicals e.g. Lathyrism caused by eating a particular toxic pulse called masur dal 8. Hereditary degenerative diseases of the spinal cord, e.g. familial spastic paraplegia, spino-cerebellar disease etc
9. Degenerative diseases of unknown cause, like the motor neuron diseases
10. Symptoms of damage in the spinal cord due to unknown reasons.

It is not very difficult to diagnose these spinal cord diseases; it's a kind of calculation. With experience and intuition coupled with, a detailed medical history and efficient neurological reports one can get an accurate diagnosis.

To confirm the diagnosis the **main investigations** are mentioned below:

1. MRI and CT scan of the spinal cord.
2. Cerebrospinal fluid examination.
3. Myelography.
4. Special laboratory investigations, biochemistry etc.
5. If necessary, E.M.G., V.E.P., genetic investigations are also carried out.

### **Treatment :**

(1) A complete diagnosis is very important for necessary treatment. If the disease is due to the compression of the spinal cord, it is important to decide if surgery is possible or not. Surgeries ranging from, long, complicated microsurgery; to the surgeries to dissolve tumors with the help of ultrasound (CUSA) are now available in our country. Surgery of the spinal cord is normally not dangerous, but it is undeniable that the operation has to be done very delicately, skillfully and systematically, because the spinal cord is very narrow and congested with innumerable nerve fibres. Thus, to prevent any damage, the surgeon has to be very cautious during surgery.

The non-compressive disorders are treated according to the underlying cause like:

- 1) Treatment for TB.
- 2) Use of steroids for the treatment of multiple sclerosis and other demyelinating diseases, as well as collagen diseases.
- 3) Vitamin deficiency is treated accordingly.... etc. Specific treatments for congenital diseases or degenerative diseases (like motor neuron disease) have not yet been discovered.

Physiotherapy (exercise) is necessary in all these diseases along with nutritious food. One should also be careful about bedsores. If there are associated bowel and bladder problems they should also be treated simultaneously:

It is not possible to write about all the diseases of spinal cord due to limitation of space, however above information should suffice.



# 16

## MULTIPLE SCLEROSIS

The diseases of the brain and spinal cord in which myelin sheath or white matter is affected are known as demyelinating diseases. The cells of the human nervous system are anatomically and physiologically divided into grey matter and white matter. The white matter can be compared to the electrical wires that perform the important function of transporting the sensations or commands originating from gray matter cells to other parts of the nervous system. The electrical wires have an outer cover for insulation. Similarly, the white matter has a myelin sheath for insulation. The diseases damaging the myelin coating of the white matter are known as demyelinating diseases. The most important, strange and painful demyelinating disease is called multiple sclerosis. In simple language some type of allergy or disturbance in metabolism of brain, damages the white matter. This is called as demyelination and gliosis. In this disease specific symptoms are seen in the brain, spinal cord and mainly the sensory nerves of the eyes.

### **General Information about the disease :**

- This disease is twice more common in females than in males.
- It is generally seen in age group of 15 to 50 years. Generally it is not found in children and elderly people.
- This disease is more prevalent in Scotland, North Europe and America. It is seen prominently in the countries that are away from the equator, thus the proportion of this disease is comparatively less in India.

Like many other brain diseases, the causes of this disease are also awkward and still not properly understood. In a few cases it seems to be hereditary, but in other cases the reasons may not be hereditary.

This disease may occur due to some virus, environmental factors or irregularities in lifestyle and food habits.

**Symptoms :**

1. Paralysis of one or more parts of the body: in 35% cases.
2. Loss of vision or diplopia: in 36% cases
3. Loss of sensation in some parts of the body (in 37% cases) or abnormal sensations like pricking of needles (in 26% cases).
4. Loss of balance, vertigo, problems of bowel and bladder movements.
5. Loss of memory and seizures.
6. Tremors of limbs, pain, and problems in sexual life, mental disorders ranging from insanity to depression may be seen.

Multiple sclerosis may start with one or more of the above symptoms and it may....

- either be cured completely, recover and recur again (relapsing variety) or
- gradually go on increasing in intensity after a mild beginning (chronic progressive variety) or
- Initially relapsing disease may become permanent after a few years.



**Diagnosis :**

It is important to contact a physician/neurologist immediately, if the patient is suffering from above mentioned symptoms, especially the ones related to eyesight, paralysis or equilibrium.

Diagnosis mainly requires some specific blood tests and Magnetic Resonance Imaging (MRI). Besides this C.S.F. (lumbar puncture) examination is also important. The C.S.F. test shows increase in cell count, increase in protein levels, specifically gammaglobulin. Oligoclonal band ( $1_gG$ ) is seen with increase in the myelin basic protein level. V.E.P, S.S.E.P, B.E.R.A tests are helpful in confirmation of diagnosis.

Thus, physical examination and above-mentioned tests can help in accurate diagnosis.

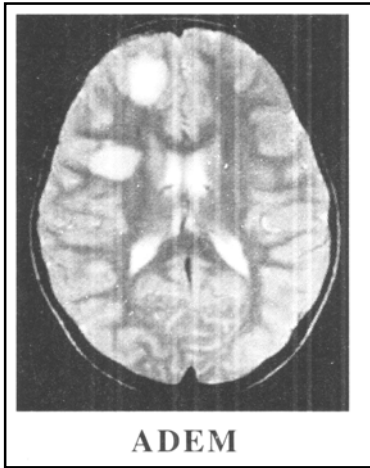
**Treatment :**

A few years ago, this disease was considered incurable; but modern medical science has partially succeeded in-the treatment of this disease.

1. When the attack of the disease occurs steroids should be started, especially injections of methyl prednisolone or injections of A.C.T.H. followed by oral prednisolone.
2. When the disease increases gradually and becomes permanent, methotrexate, azathioprine etc. are used. Mitoxanthrone (Novantrone) is currently being investigated for secondary progressive MS. cases.
3. In order to prevent an attack, beta interferon 1a (Avonex), beta interferon 1b (Beta seron), Copaxone are used. These medicines are called ABC medicines and are the basic drugs for this disease but are very expensive and are to be taken under the guidance of a specialist.

4. Gamma-globulin therapy is rather costly but has proved to be effective in certain cases.
5. In this disease the patient may suffer from severe pain, tremors and stiffness of limbs, bowel and bladder problems, weakness, lethargy, problems in sexual life and mental depression which should be treated symptomatically.

**ADEM (Acute Disseminated Encephalomyelitis) :**



A neurological illness that comes a few days after any form of viral illness (viz. measles, chicken-pox etc.) is most likely an ADEM. The symptoms are related to the cerebrum, cerebellum or spinal cord. The incidence is 1 in 2000 patients of viral illness. Occasionally such illness may follow vaccination for rabies etc. The incidence of ADEM tends to be more in children.

In some cases memory impairment or behavioural disorders persist while in some seizure disorder may be precipitated. Prognosis is good in adult patients and in those with cerebellar symptoms.

This disease is different from the viral infections directly damaging the brain. There is no direct or microscopic evidence of viral infection and the symptoms start after 2 to 20 days of virus infection. It is a post viral sequelae:

It is believed to be due to decrease in the resistance power of the body (i.e. Immune-mediated). However, newer tests available can elicit DNA links to the virus.

### **Symptoms :**

1. **Encephalitis** : Restlessness, confusion, disorientation, drowsiness or seizures can occur. The patients may also have headache, fever, unsteadiness or myoclonic jerks. Some patients may have altered sensorium loss of consciousness or respiratory problems.
2. **Myelitis** : In this type of illness, symptoms relate to the spinal cord. This is known as post-infective myelitis or transverse myelitis. The patient may have weakness of both legs or all four limbs with decreased sensation. There may be difficulty in urine or stool control.

In measles or chicken-pox the child develops rashes over the skin. After 2 to 4 days the child may develop fever, seizures (convulsions) or may become unconscious. Cerebellar involvement is more common after chicken-pox. The main symptoms are imbalance, unsteadiness. A few other viruses like Epstein-B arr, mycoplasma, cytomegalo virus etc. can also cause ADEM where cerebellar symptoms predominate. This disease is different from viral cerebellitis which results from the direct infection of cerebellum by a virus.

As mentioned earlier, encephalomyelitis may also occur following vaccination for rabies, small-pox etc. Approximately one in 750 people receiving antirabies vaccine is likely to develop this illness and the mortality rate can be as high as 25%. However, HDCV, a newer anti-rabies vaccine is much safer and does not have neurological side effects.

Though the mortality and morbidity tend to be high, recovery can be excellent if the disease is controlled in the initial stages. Usually relapse is uncommon.

High potency steroids should be used to treat ADEM. In more serious patients, plasma exchange or IV gamma globulin; though expensive can be life saving therapies.



# 17

## MOTOR NEURON DISEASE

This is a cruel disease in which there is gradual wasting – degeneration of the muscles. Even after numerous researches no accurate or effective treatment is yet available and the patient becomes weaker and thinner day-by-day and the doctor and relatives, helplessly watch him getting closer towards certain death. Unfortunately, the brain keeps on relatively functioning normal, till the end, so thoughts, emotions, consciousness, pain etc can still be felt.

### **Types of Motor Neuron Disease :**

1. First of all, let us discuss about the primary (idiopathic) motor neuron disease, which occurs due to unknown reasons. In this, the main defect is in the motor neurons, and so the anterior horn cells from which the nerves of the spinal cord originate, and the brain stem or the bulbar neurons from which the cranial nerves emerge, are gradually destroyed due to some unknown reasons.
2. The muscles in the hands and legs start wasting and the movement becomes less. There is difficulty in holding things, writing or moving the hands up and down and gradually climbing stairs and even wearing footwear also becomes difficult. In 3 to 7 years of the onset of the disease the patient becomes completely bedridden and the body weight reduces drastically. This type is called **Amyotrophic Lateral Sclerosis (A.L.S.)**. In this, the anterior horn cells of the spinal cord as well as the pyramidal fibres, which control the spinal cord, are affected. In neurological language, in

this disease signs of both upper and lower motor neuron dysfunction are seen (on examination).

3. **Progressive Muscular Atrophy** is a type of motor neuron disease in which the pyramidal fibres are not affected and thus the neurological signs of upper motor neuron are not seen (like brisk jerk, extensor plantar etc). This is comparatively a slow -evolving disease.
4. As mentioned earlier, in **Bulbar Motor Neuron disease**, the cells from which the cranial nerves emerge get afflicted and so important functions like swallowing food, and speech etc get affected and there is difficulty in respiration. In this, the death occurs quickly within 1 to 3 years.
5. **Pseudobulbar Palsy is related to A.L.S.** and is a disorder of the cranial nerves in which as mentioned earlier swallowing, speech and some other functions are affected. Involuntary laughter, crying etc. like peculiar symptoms may also be seen.
6. In some cases by chance the disease is limited to a single limb, which is known as **Monomelic Motor Neuron Disease**. Associated deafness, which is not present in other motor neuron diseases, is noted in **Madras Motor Neuron disease**.

### **Diagnosis :**

The disease can be diagnosed accurately with E.M.G. test. It is essential to get a confirmed diagnosis of this disease by a Neurologist, as the patient has very less active functional lifetime left after being afflicted by this disorder. Therefore, it is always better to systematically arrange

financial, medical, and social requirements as soon as possible. Many a times, the symptoms similar to motor neuron disease are also caused by diseases like deficiency of Parathyroid Hormone, spinal cord injury (whiplash injury), effects of metals on the body (like lead), radiation, side effects of chemicals, myeloma as well as other types of cancers or AIDS. This category is called **Secondary Motor Neuron Disease**.

### **Treatment :**

1. The patient and the relatives should be timely informed about the seriousness of the disease, so that the patient can make arrangements for the rest of his life.
2. Muscles can be kept functional, as far as possible by physiotherapy, muscle training, walking exercise etc. Along with that the patient should make use of instruments like crutches and calipers, to ease the functions like walking and moving hands.
3. This agonizing disease has no specific treatment. After a lot of research, a recently discovered drug called Riluzole (Rilutec) is being used. Usually it is given for 3 months and the expenses come to about 60 to 70 thousand Indian Rupees. But the disease can be slowed down only for about 3 to 6 months, which only prolongs the torture. The general experience is that it has no magical role in the treatment, although it can be used in appropriate cases.
4. If swallowing of food, speech etc gets affected; proper training can help to a certain extent. If that fails, Ryles tube can be used for feeding. Better still is **gastrostomy**

**feeding**, in which a tunnel is made under the skin, and a tube is passed through the stomach to give the necessary nutrition.

5. Necessary medical treatment should be given in case of emotional lability, depression, involuntary laughing and crying etc.
6. Exercises of the respiratory muscles should be started right from the beginning. Eventually the life span of the patient can be prolonged a little, by helping in respiration with the ventilator machine. Nursing care, love of the relatives, affectionate treatment from the doctor etc. can provide support to the patient in his fight against this incurable and painful disease in his remaining life.
7. There is an association of patients of this disease called “Motor Neuron Disease Association” which provides relevant information to the patients.





In this chapter, we will discuss about the diseases of the nerves, which originate from the brain and the spinal cord, and carry messages to the muscles of the face, neck, limbs, chest, stomach etc and take the sensory impulses from the skin and other sensory organs as well as important organs to the brain and the spinal cord. The nerves that carry messages to the muscles are known as motor nerves and the nerves that carry sensations from end organs towards brain are called sensory nerves. The initial part of the nerve emerging from spinal cord is called a radical. These radicals are again of two types; motor and sensory. The diseases of the radicals are known as radiculopathy. Whereas the diseases of the nerves mentioned earlier are known as peripheral neuropathy.

There are many types of peripheral neuropathies and the main ones are polyneuropathy, entrapment neuropathy, mononeuropathy, mononeuropathy multiplex etc. peripheral neuropathy occurs due to many diseases and various other causes.

Many neuropathies are primary where the neurological disease occurs on its own like hereditary neuropathy (HMSN-I to HMSN-VI) or A.I.D.P. There are other cases in which the neuropathy is secondary to other neurological disease or disease of any other system, e.g. neuropathy related to cancer or affliction of nerves occurring in long term diabetes. In some rapidly progressing neuropathies like A.I.D.P. immediate hospitalization may be required.

In mononeuropathy there is damage in the working of one or more different types of nerves, which ache together. In entrapment neuropathy one or more nerves are compressed somewhere in their routine pathway e.g. carpal tunnel syndrome in which the median nerve gets compressed at the root of the wrist.

In polyneuropathy, usually sensations decrease equally on both sides of the body, muscle power decreases and other problems like bowel and bladder problems also arise. Polyneuropathy is usually of two types:

- 1. Axonal Neuropathy** in which there is tingling in the palms and soles of the hands and feet, burning sensation, and the disease starts spreading upwards gradually weakening the muscles and reducing the sensations. Metabolic diseases like diabetes, diseases of the kidney, liver, vitamin deficiency, poisonous chemicals, heavy metals and side effects of medicines (some antibiotics, cancer chemotherapy, anti malarial... etc) cause Axonal Neuropathy. This disease occurs gradually, is of long duration and difficult to cure.
- 2. Demyelinating Neuropathy** : In this, abnormality occurs in the insulatory myelin sheath of the nerves. It can be considered a kind of allergy. Virus or other causes may damage the myelin sheath covering the nerves, disturbing the functioning of the nerves. Some neuropathies may occur quickly and recover quickly too, and some may even be life threatening like A.I.D.P. about which we will discuss in detail. Many neuropathies may recur after recovering. In many cases diseases of the muscles and nerves are seen simultaneously like Myotonic Dystrophy.

In short one can say, that heredity, virus, cancer, side effects of medicines, disease of any part of the body, deficiency of nutritional elements, leprosy, diabetes - such various reasons can affect the nerves. In other words if the nerves are afflicted, it may be necessary to investigate systematically the entire body to find out the source of the disease and even then the exact reason cannot be found in 20 to 30% polyneuropathy cases, which is still a challenge to modern medical science.

**I. A.I.D.P. :** means **Acute Inflammatory Demyelinating Polyradiculoneuropathy**. It is also known as **G.B.S. or Guillain Barre Syndrome**. In this disease,, for some intricate reasons the nerves become weak. It first starts from the patient's legs causing symptoms ranging from tingling and numbness in the legs with nominal weakness to paralysis of the limbs, some life threatening symptoms related to respiration may also be seen in patients of this disease. The inflammation of the nerves due to some reasons causes an increase in the proportion of . cells called Monocyte Macrophages. As a reaction to this, the coating of the nerves called myelin is destroyed resulting in the weakening of the nerves. It is believed that formation of antibodies against myelin starts the process of the weakening of the nerves.

The causes of the above mentioned reactions are not clear, although in 50% to 60% patients, viral infections of the throat, stomach or intestines precede the occurrence of A.I.D.P. In some patients the disease is seen occurring after taking the vaccine for rabies, tetanus and polio. A.I.D.P. can also occur in a few weeks after a minor surgery.

This disease can occur at any age, especially in the age group of 40 to 55 years. Not only this, research shows that a relation of this disease can also be established with particular seasons. The disease can be divided into 3 parts according to its intensity - mild, moderate and severe.

In the initial stage of the disease the patient experiences tingling in the feet, cramps, pain, or in many cases the patient may lose balance while walking. Both the legs get affected almost at the same time and as the weakness increases gradually both the legs and hands become completely paralyzed. This can happen in 2 -4 days or two to four weeks.

When the cranial nerves are affected, the facial muscles stop working. There is a change in the voice and difficulty in swallowing food. While drinking water, the water may come out through the nose and there may be difficulty in respiration. 10% of the patients suffer from life threatening respiratory problems. Such patients can be given artificial respiration through a **ventilator**.

The other symptoms of this disease include irregularity of the heartbeats and sometimes there may be low B.P. or profuse perspiration. There is a decrease in the sodium content of the blood. The patient remains completely conscious and a few may lose bowel and bladder control, but this happens rarely.

### **Diagnosis of the disease :**

The primary neurological examination of the patient with the above mentioned symptoms could give important clues indicative of the diagnosis, in which mainly “**Tendon Jerk**” (the involuntary contraction of a muscle produced by striking the tendon) is destroyed in this disease.

The second conclusive investigation is the C.S.F. test that shows an increase in protein levels (especially Ig G) but there are hardly any cells.

The tests called **E.M.G.**, **N.C.V.** show a decline in strength and working of the nerves.

### **Treatment :**

It is advisable for patients suffering from A.I.D.P. to be admitted to the hospital for the first 1 to 2 weeks. Since there is a difference of opinion regarding the indication of steroids like **Methyl Prednisolone** and **A.C.T.H** in the treatment of this disease, new drugs are being used in place of them.

In the **Plasmapheresis** therapy, 1500 to 3000 ml blood is taken from the patient's body at a time and purified. The cells are separated with the help of a cell separator, purified, harmful antibodies are removed and the purified blood is transfused again in the body. This treatment can arrest the progress of the disease, prevent respiratory difficulties and speed up recovery. This method is carried out on alternate days for approximately five times.

Another more effective drug is **Gamma globulin**. Given intravenously, this drug neutralises harmful antibodies. This medicine is given for 5 days in a daily dose of approximately 20 to 30 grams (400mg/kg body weight). There are very few side effects of this drug. It can also be given to children as well as heart patients, but the treatment being very expensive, makes it difficult for many patients to take advantage of this drug. A drug called Fucidine has also been found effective, in A.LD.P. patients. It is not so expensive but is still in the experimental stage.

Apart from treatment, A.I.D.P. patient has to take certain other precautions too. The patient should get proper nutrition, and care should be taken to prevent bedsores and infections. The doctor should be informed immediately if there is slightest respiratory distress. In emergency, the patient can be kept on a ventilator, which is expensive, but can save life. Besides, physiotherapy has been found to be extremely beneficial in this disease and is an important aspect of treatment. In the initial fifteen days if the disease is not progressing and especially there are no respiratory problems, the possibility of complete recovery is greater, though it may take months to get completely cured.

## **II C.I.D.P.:**

When A.I.D.P. keeps progressing for a long time (2 months) or recurs frequently, it is known as C.I.D.P. (Chronic Inflammatory Demyelinating Polyradiculoneuropathy).

If the disease has occurred only due to neurological causes, it looks like motor neuron disease.

Many a time symptoms of C.I.D.P may occur due to HIV infection, S.L.E, plasma cell dyscrasias etc.

### **Treatment :**

- If there is any other disease mentioned earlier, it is detected and treated and especially steroids, plasma exchange, azathioprine are used. As in the treatment of A.I.D.P, immunoglobulin can also be used.
- Physiotherapy plays a very important role in most of the neuropathies. If required, braces, splints, boots and other such instruments can be used to make life as easy as possible for the patient.

- Painkillers can be given when the patient is in pain.
- After a period of time, minor or major surgery may be performed to get maximum potential from the patient's muscles, so that the weaker muscles can be assisted.

### 1. **Bell's palsy and other such neuropathies :**

This is another disease that occurs due to virus. It paralyses only the facial muscles of one side and is called Bell's palsy. In this disease there is an inflammation on the seventh cranial nerve, which largely occurs due to wind, infection or damage in the ears.

#### **Symptoms :**

The eyes do not shut completely. The mouth gets twisted and saliva dribbles from one side. The affected cheek cannot be blown completely. Sometimes there can be pain behind the ear, extra sounds in the ears and there may be loss of taste in the tongue. If the treatment is commenced immediately, 90% to 95 % patients get completely cured in one to two months. The virus in these cases is usually Epstein Barr, herpes or cytomegalo. Sometimes the 7th cranial nerves of both sides get affected at the same time, but usually only one side is affected. In some cases the disease persists for a long time or keeps recurring frequently causing facial paralysis again and again.

The mainstay of treatment is use of steroids, optimum physiotherapy, proper eye care and use of antiviral agents (like acyclovir in herpes virus infection) and supportive measures.

### 1. **Neuropathy due to Diabetes :**

Over a period of time, diabetic patients may suffer from neuropathy. Neuropathy occurs earlier in cases where

diabetes is of longer duration and uncontrolled. Longer the duration of diabetes and poorer the management, earlier the occurrence of neuropathy. Many types of neuropathies occur in diabetes, the symptoms of which are mentioned below:

- Weakening of the nerves causes difficulty in walking, climbing stairs etc. Due to the loss of sensation, even if the footwear comes out of the feet, the patient doesn't know it, severe pain occurs in the feet or thighs.
- There is a sensation of cushioning and burning sensation in the soles of the feet. There is tingling or numbness in hands and feet. There is loss of pain sensation. While having a bath one is unable to tell the difference between hot and cold water, sensation of the palms and soles is decreased. Ulcers on sole develop and if proper foot care and dressings are not done, this can lead to an unfortunate steps of amputation of the foot; which is a common Cx.
- Urinary problems, sexual weakness, loose motions or constipation may occur. There is either very heavy or - very less sweating. There may be fluctuations in the heartbeats.
- Burning sensation in any of the nerves on the chest and the stomach.

### **Treatment :**

Relief can be obtained by controlling diabetes completely, preferably with Insulin. There are suitable medicines to control the symptoms of neuropathy, which may provide more or less relief. Physiotherapy and foot care are highly important.



## 5. Leprosy :

Leprosy is quite common in our country. *Mycobacterium leprae* is the organism that causes leprosy and it mainly damages the sensory nerves causing loss of sensation in the fingers. One is not able to sense injury, the fingers of the hands and feet gradually fall off and the disease starts spreading. This is mainly of two types: (1) Lepromatous leprosy (2) Tuberculoid leprosy in which there is a comparatively less damage to the skin but neurological damage is high.

Medicines like dapson, rifampicin, clofazimine, etc as well as appropriate dressing can control the disease but treatment can continue from 1.5 to 2 years or even 10 years. Vaccine is now available to prevent this disease.

6. If there is a cancerous lesion in any part of the body it also can affect the nerves. This is known as **Paraneoplastic Syndrome**. Such a neuropathy is usually seen in lung cancer. In paraproteinemia or myeloma, neuropathy is very commonly seen. It is clear that in all the cases of neuropathy extensive investigations are very necessary.

In many cases autonomic neuropathy can occur like in diabetes. In this, rapid fluctuation of blood pressure and pulse, perspiration, loose motions, urinary problems and other symptoms related to the nerves of the involuntary nervous system occur. Due to lack of complete scientific knowledge, even doctors may not be able to recognize the disease and the diagnosis is delayed.

**7. Entrapment Neuropathy :** The most common entrapment neuropathy is the carpal tunnel syndrome, in which the median nerve is compressed by the ligament situated below the palm, causing pain and tingling in the palm, which sometimes extends up to the shoulders. Gradually the muscles under the thumb get wasted. (APB muscle is weak and wasted).

If there is no benefit after splinting the wrist or taking steroids for some time, steroids can be injected locally in the wrist at a particular point. As a last resort a small surgical procedure can be done for decompression of the nerve.

Apart from this, compression of various nerves on various locations in their pathway can cause as many as 30 different types of entrapment syndrome.

- Pronator syndrome of the Median nerve
- Tardive ulnar palsy (near the elbow)
- Radial palsy (between the shoulders and elbow). It occurs when the radial nerve is compressed while sleeping which is also known as “Saturday night palsy”.
- Meralgia paraesthetica: tingling and mild pain on the thigh caused by the compression of the lateral cutaneous nerve.
- Tarsal tunnel syndrome: the posterior tibial nerve is compressed near the ankle causing tingling and pain in the sole of the feet. A small surgery can give relief. It can be concluded from experience, that these kinds of entrapment are very common. But usually the patients suffer for a long time in the absence of a proper diagnosis. Awareness should be created for this.

## 8. Other neuropathies :

Neuropathy can occur due to deficiency of vitamins mainly of vitamin B<sub>12</sub> as well as folic acid. (This disease is known as SCD - Subacute Combined Degeneration). Excessive drinking of alcohol can result in deficiency of vitamin B<sub>1</sub>, causing a disease called Beriberi in which a painful neuropathy occurs.

Some of the drugs that can cause neuropathy are antibiotic -nitrofurantoin, cancer drug- Vincristine, anticonvulsant drug -phenytoin, drug for TB -isoniazid, etc. When the medicines are withdrawn, neuropathy gradually subsides. It should be remembered that every person taking these drugs would not suffer from neuropathy. There are many ways to prevent these effects of the drugs, like vitamin B<sub>6</sub> should also be given along with TB medicine isoniazid.

The most commonly found neuropathies in our country are the ones occurring due to leprosy, diabetes, AIDS (HIV), vitamin B<sub>1</sub> deficiency due to alcohol, nutritional deficiency of vitamin B<sub>12</sub>, and folic acid etc. It should be noted that the fast spreading neuropathy A.I.D.P. and the slow spreading neuropathy of cancer and myeloma are the most dangerous. Thus, quick diagnosis, precise investigations and appropriate treatment and physiotherapy are very important aspects of the treatment of neuropathy.



# 19

## MYASTHENIA GRAVIS

Myasthenia Gravis is a painful and long-term disorder of the nervous system affecting muscles. In this there is a periodical fatiguability of the muscles. The voluntary muscles get tired with abnormally quick speed. The muscles associated with the skeletal system like eyes, mouth, tongue, limbs are affected in this disease. The defect is found in the transmission of the impulses from the nerves to the muscles though the nerves and the muscles themselves are found to be absolutely faultless.

This disease characteristically starts before the age of 40 years in females and above the age of 40 years in males, and it is less common among children. This disease is neither contagious nor hereditary.

From a doctor's point of view this disease is divided into 4 stages and one of the primary symptoms of this disease is weakness of the eye muscles. In some patients this disease is limited to the eyes only, but in majority of cases after some time other muscles which control the functions like laughing, chewing, swallowing, speaking and the movement of limbs are affected and ultimately the muscles controlling the respiration function are also affected and the life of the patient is endangered.

### **Main Symptoms :**

1. Drooping of one or both eyelids.
2. Imbalance, weakness and lethargy in walking.
3. Weakness in hands as well as fingers.

4. Difficulty in swallowing food.
5. Difficulty in talking, lowering of voice while talking, sounds from the nose.
6. Problems of respiration.

Respiratory problems in a patient suffering from Myasthenia Gravis can prove fatal. It is very important to admit such a patient to the hospital. In the advanced stage of the disease or in stressful physical situations like infection or pregnancy, respiratory problems can occur.

There is a recurring weakness in the muscles due to this disease, which may subside or increase in a period of time or remain as it is for a long time. Though the intensity of this disease can vary every hour in a patient and from patient to patient, at the end of the day the patient may seem weaker due to exertion and slight improvement may be seen after relaxing. In these circumstances, the patient can lead a near normal life with the help of modern treatment.

In this disease the thymus gland also plays a very important role. The cells of this gland are considered a part of the immune system of the body. This gland situated in the chest, is large in infancy, which gradually reduces in size with age, and in an adult it is almost invisible. But in most of the patients of Myasthenia Gravis, the thymus gland is found to be large. In 10% to 15% patients a tumor of the thymus gland called thymoma is seen which is usually benign, but sometimes there may be a possibility of malignancy. 5 % of these patients are also seen to be suffering from associated thyroid disorders.

Myasthenia Gravis can crop up suddenly and cause aggressive weakness in all the muscles. Many a time it is difficult to diagnose the disease from the primary symptoms, but a specialist doctor can detect the disease from its signs and symptoms. Special attention is given to the fatiguability of the ocular muscles and the muscles of the limbs.

### **Diagnosis :**

1. **Acetylcholine receptor antibody test.**
2. **E.M.G:** The nerves are stimulated electrically, which can demonstrate the defect in their capability to conduct the impulses.
3. **Tilstigmin test :** If an injection of tilstigmin gives immediate relief in the symptoms, it is considered as the confirmation of the diagnosis.
4. **CT Scan thorax :** this test is mainly done to detect the tumor called thymoma in the chest.
5. Thyroid function tests and other relevant blood tests.

### **Treatment :**

Anticholinesterase drugs like neostigmine or pyridostigmine are used in the treatment of this disease that strengthens the impulse going from the nerves to the muscles. This helps in the availability of acetylcholine for a longer period, increasing the contractibility of the muscles. This medicine is very beneficial for the patient but it does not help the patient to carry on all his activities with the strength he had before the onset of the disease.

The surgical removal of thymus gland proves to be more effective. More than 50% of the patients benefit if this surgery is done in the initial stage of the disease. Rest of

the patients benefit by the use of the steroid group of drugs. Some patients get relief by a drug called Azathioprine, but its long-term use causes side effects.

In severely afflicted patients, a treatment called Plasmapheresis is done, in which the patients own blood is transfused back after purifying it. This process removes the acetylcholine antibodies and other toxins, which cause the defect in the conduction of the impulse to the muscles. This treatment is attempted when all other treatments have failed and the patient is in serious condition. This treatment can save life of the patient in myasthenic crisis or when the disease reaches the third, fourth or last stage.

Another treatment which is as effective as Plasmapheresis but extremely expensive is the Immunoglobulin therapy, in which immunoglobulin collected from the blood of healthy individuals or prepared synthetically is introduced in the patients body in very high doses. Usually a dose of 400-mgm\cgs-body weight is given per day for 3-5 days The approximate expenditure of this treatment is about 1.5 lakh Indian Rupees (15C1 Thousands). This treatment can rapidly control the disease and the patient's life can be saved.

Myasthenia gravis is a difficult and tough disease. The intensity as well as the frequency of the disease being different in every patient. If diagnosis is done in the early stages and treatment taken from a specialist most of the patients get relief and lives can be saved. Only a specialist can decide which drug or therapy is most suitable for a particular patient.



# 20 DISEASES OF THE MUSCLES

So far we have learnt about the various diseases of the brain and the nervous system. Now we will discuss the basic diseases of the muscles. We know that the brain regulates every part and organ of our body. This system consists of the large brain, small brain, spinal cord, the nerves emanating from them, the **neuromuscular junction** and **muscles**. In the previous chapter we have discussed in detail about the disease of the neuromuscular junction namely, Myasthenia Gravis.

Now we will start with the hereditary muscular disorders i.e. **hereditary myopathies** which form the major chunk of muscular diseases.

## 1. **Duchenne Muscular Dystrophy :**

This hereditary disease is a sex-linked recessive disorder of muscles related to X- chromosome which is found in about 30 per one-lakh boys. The females do not suffer from this disease but they are the carriers of the disease. This disease is present from birth but its symptoms are noticed at the age of 3 to 4 years. The child falls while walking, has difficulty in getting up and climbing stairs with a gradual increase in weakness. The muscles of the calves get enlarged which is known as Pseudo Hypertrophy. By the age of 10 -12 the patients need to take the support of a wheel chair. These patients are highly susceptible to aggressive and life threatening infections of the lungs. Such children may suffer from slow mental growth and heart diseases.



**Diagnosis :**

This disease is diagnosed as described below

1. In the blood samples increased value of enzymes like C.P.K., SGOT and Aldolase are noted.
2. Particular, definite changes are detected in the E.M.G test (Myopathic pattern).
3. Microscopic examination of muscle biopsy gives a confirmatory diagnosis.
4. Symptoms of this disease may be seen in other male offsprings in the family, or in mother's brothers and their sons.

**Treatment :**

No permanent cure has yet been discovered for this disease though steroids can control the disease to some extent. However, physiotherapy and willpower play an important role in supporting these patients. There are supportive groups like Muscular dystrophy association and D.M.D., which help the patients. Gene therapy seems to be promising in latest researches.

**2. Becker Muscular Dystrophy :**

This disease is a sex linked recessive disease linked to X- chromosome, in which the muscular weakness is similar to that of Duchenne Muscular Dystrophy, but the amount of the weakness is less and the speed of spreading of the disease is slow. The primary symptoms of the disease are seen in 5 to 15 years of age and the patient usually lives up to 4 to 5 decades.

### **3. Limb Girdle Dystrophy :**

This muscular disorder is found in both males and females between the first and fourth decade of life. This gradually progressing disease causes weakness in the muscles of the back and shoulders. The weakness of the diaphragm can sometimes cause serious respiratory problems. Heart related problems could also occur.

### **4. Myotonic Dystrophy :**

In this disease the muscles of the face become weak. The patient's face gives the diagnosis. The muscles of the hands and the neck are also affected. Myotonia is seen in which if the fist is clenched, it cannot be opened easily. Mental retardation, heart diseases, cataract etc are also seen in the patients. Apart from this, in facio-scapulo-humeral muscular dystrophy there is weakness of the muscles of the mouth, shoulders and hands. In Myotonia a drug called phenytoin is given.

### **5. Congenital myopathy :**

The muscular disorders seen in infants include the central core, nimeline and centro nuclear myopathy. Defects in the metabolic functions can also cause weakness in the muscles.

Besides this, any disorder of the main part of the cells namely mitochondria causes a congenital disease called mitochondrial myopathy.

### **6. Metabolic Myopathy :**

Congenital metabolic disorders like glycogen storage, myophosphorylase, lipid storage, and some other mitochondrial myopathies are included in this. This is not a common Myopathy.

## 7. **Periodic Paralysis :**

A deficiency of potassium in the blood can cause hypokalemic periodic paralysis in which the shoulder muscles and the thigh muscles weaken. This disease can recur time and again. Sometimes, it can also affect the muscles of the eyes as well as the respiratory muscles, which can prove fatal if not treated properly. Fluctuations in the heartbeat are also seen. There is decrease in the amount of potassium in the blood. Tendon jerks are found to be sluggish.

Intravenous or oral potassium removes the weakness of the muscles. A doctor's supervision is very essential in this matter, because overdose or low dose of potassium can cause serious side effects.

## 8. **Hyperkalemic periodic paralysis :**

An excessive amount of potassium in the blood also causes similar type of weakness in the muscles.

## 9. **Paramyotonia congenita :**

In this disorder the muscular weakness can occur due to cold climate or without any apparent reason. This weakness increases with physical activity. Intake of glucose or other carbohydrates can alleviate this weakness. In the long run thiazide diuretics can be helpful.

## 10. **Acquired Myopathy :**

In this type there is no congenital defect in the muscles but the muscular weakness arises due to increase or decrease in **thyroid hormone** production, increase in the parathyroid hormone, excessive consumption of steroids, side-effect of other medicines, inappropriate treatment of diabetes, chronic

diseases of the kidney or liver, excessive consumption of alcohol or vitamin deficiency etc. This can be treated after appropriate diagnosis.

We will now study in detail about the difficult diseases occurring due to the inflammation of the muscles.

### **Polymyositis and Dermatomyositis :**

In these diseases, initially the process of inflammation occurs in the muscles and the muscles start becoming emaciated-wasted. The main symptom of this disease is the weakness of the muscles that gradually increases and makes the patient handicapped. Reddish erythema is seen on the face, back, chest, elbows and knees of the patient. There can be pain in muscles in 50 per cent of cases.

### **Causes :**

These diseases are not hereditary diseases. Changes in the protective immune system of the body, produce cells, which destroy the cells of the muscles and hence this disease occurs. It should be noted that this disease is not contagious.

### **Symptoms :**

The symptoms, their intensity and the rate of development shows a lot of variation. Weakness in the muscles spreads in a few months. Some times it may hold back, but in most of the cases if the right treatment is not taken, the weakness keeps on increasing gradually.

The patient's gait (walk) becomes unstable and he starts falling frequently. With the passage of time. the patient is unable to walk and becomes bed-ridden. In the rapidly

increasing disease, the possibility of cure is greater. Approximately 50% of the patients improve with medicines. Patients suffer from pain in the muscles specially while climbing steps, getting up from the chair, raising the hand up etc. Many a times there is difficulty in swallowing solids and liquids, and respiratory distress. This disease is usually seen after the age of 18.

### **Diagnosis :**

**Along with the above mentioned symptoms :**

- There is an increase in the proportion of C.P.K. in blood.
- The investigations like E.M.G., N.C.V. are considered very useful for diagnosis.
- In muscle biopsy, the muscle sample shows obvious changes, which is confirmative of diagnosis.

### **Treatment :**

#### **(A) Medicines :**

1. Steroids like Prednisolone, Methyl Prednisolone, and Dexamethasone.
2. Immuno suppressive drugs like Azathioprine, Methotrexate, Cylophosphamide.
3. Cyclosporin: This drug helps in controlling the disease well, but in the long run the side effects of the medicine are seen.

#### **(B) Plasmapheresis :**

This procedure involves purification of blood by removal of the abnormal proteins to control the disease.

**(C) Immunoglobulin :**

Intravenous administration of this drug is beneficial, but this treatment is very expensive. Along with this, the importance of physiotherapy cannot be neglected. If physiotherapy is done regularly everyday, it can prevent the muscles from deteriorating to a certain extent.

It is important to get immediate advice from the doctor instead of considering the problem as an ordinary pain and letting it deteriorate further.



# 21

## STRESS AND ITS MANAGEMENT

### **What is stress?**

Stress is the strain on any system of the body and its consequences. The reaction of our mind and body towards environmental and social challenges in our life is called stress. Stress is not always negative or harmful; at times it can have positive effects too. Stress increases the capacity to deal with unexpected situations. In challenging situations like competitions or exams, stress makes a person alert and strengthens the performance.

### **What is the reaction “to fight or run away”?**

In stressful situations, our body undergoes various biochemical changes, which produce two kinds of reactions - to fight or to run away. Let's see what exactly happens in the body during this phase. During stress, our sympathetic nervous system gets excited, resulting in the secretion of adrenaline and nor-adrenaline from the adrenal gland causing specific reactions in the body.

### **The immediate effects of stress on our brain and body :**

1. The respiration becomes rapid and shallow.
2. The heart beats and the blood pressure increases.
3. The blood supply to the limbs decreases, whereas the circulation of blood in the muscles increases.
4. The muscles contract, hands and feet become cold, perspiration takes place, hair stands on ends and sometimes shivering may occur.
5. The process of blood clotting becomes faster.

6. The pupils of the eyes widen.
7. Our senses become alert and thus the sense of hearing, seeing and smelling\* becomes sharper.
8. The metabolism of the body becomes faster.
9. The thinking process of the brain becomes quicker.
10. Decision power and capacity to analyze the situation enhances and the memory becomes sharper. Sometimes the fear of “what will happen” may also grip the mind.

### **The Negative effects of prolonged stress on the body :**

#### **1. Behavioural Problems :**

The temperament becomes angry and irritable, working capacity decreases; the ability to differentiate between good and bad and concentration become poor, the person falls a prey to bad habits, loses interest in eating or starts overeating. These are the behavioural changes that occur due to stress.

#### **2. Physical Problems :**

Headache, asthma, high blood pressure, rheumatism, skin diseases, heart disease, peptic ulcer, insomnia, seizures, depression etc. are the physical manifestations of stress. According to an estimate, 80% of the diseases manifested as physical disorders, are actually due to mental stress. These are known as psychosomatic diseases. Stress also reduces the immunity of the body, hence recurrent infections can occur.

#### **Causes of Stress :**

There are different stress-causing factors and situations for different people.



**A) Personal and Family Causes :**

1. Difference of opinion among the family members
2. The difference in life styles
3. Misunderstanding or jealousy
4. Fights for property
5. Death or illness in the family
6. Financial problems
7. Problems due to children
8. Failure in love and marriage and
9. Marital problems.

**B) Occupational and Career Related Problems :**

1. Excessive workload
2. Extremely high ambitions
- 3: Lack of opportunities, unemployment, limited income
4. Exams, interview, transfers, training
5. Politics and corruption at work place
6. Difficulty in getting along with co-workers and
7. Lack of job/business satisfaction.

**C) Social Reasons :**

1. Poverty
2. Religious differences
3. Crime
4. People who have undergone an accident or witnessed one
5. Personality type A, in which the individual is highly ambitious, competitive, proud or arrogant, can also create a stressful environment

6. Birth, marriage, pregnancy, divorce, retirement, death and such other situations in life can also cause stress and
7. Along with this, modern lifestyle and the wish to stay ahead in the rat race of this modern world, can easily lead to stress and stress related diseases.

**The methods to overcome and stay away from stress :**

First of all, it is important to find out the factors, which are causing stress and try to get an appropriate solution with a calm mind. The symptoms of stress should be considered as a warning and immediate steps should be taken to alleviate them.

**Management :**

In order to understand the stress causing factors and its symptoms, it is necessary to evaluate the situations that are causing the stress and find out the options to resolve them.

**How to cope with the existing situations :**

**1. Handle stress sensibly and calmly :**

For example, during exams make changes in the daily routine, prepare a timetable and study accordingly under proper guidance.

**2. Get out of the situation :**

For example, if the stress is due to a misunderstanding with somebody and there is no chance of improvement of relationship, it is better to end the relationship. Do not advance in a new relationship in a hurry and do not take over new responsibilities. Find some solitude for a while. New acquaintances means newer situations and increased stress. Therefore, wise people should avoid such situations or keep them to a limit.

### 3. **Wait and Watch and Relax :**

Wait for the right time, for example, wait for the exam results in a calm manner.

### **Coping with Mental and Physical Stress :**

1. **Regular Meditation :** Meditation can be done in many ways. Patanj al Raj yoga meditation, mantra chanting, prekshadhyana, vipashyana, concentration on breathing, praptidhyana, chanting of “Om”, staying quiet for a period of time (sadhumauna), progressive relaxation techniques etc. are various methods of meditation. Meditation is the best medicine for stress and it is advisable to practice it daily. It is a must during stressful situations. It is advisable to do meditation for 30 minutes daily.
2. **Pranayam :** Breathing exercises are very effective in stressful condition and can be considered one of the best ways to protect against stress.
3. **Exercise :** Walking, running, aerobic exercises, gymnastics, yoga, sports, swimming etc. done in proper way regularly can reduce stress. Such exercises can be done from 5 minutes to 40 minutes. These should be done at least 4 to 5 times in a week. Shorter exercises can also be done for 2 to 5 minutes during work e.g. rotating the neck, exercises of the hand and the wrist, facial exercises, or climbing two to three steps after — every few hours.
4. **Bio - feedback :** Progressive relaxation, laughter therapy, focusing attention, vipashyana, self-hypnosis, systematic desensitization, etc. are also very beneficial. This is a scientific fact.

5. **Changes in the diet :** Nutritious food, high proteins, fruits, adequate breakfast and fibrous foods help relieve tension. Vitamins as well as anti-oxidants taken in proper proportion can prove very advantageous. Fatty, spicy or very hot food, as well as fast foods can be harmful. The idiom “you are what you eat” is absolutely true in this context.
6. If necessary, **help from doctor** or a **professional** should be taken. Various courses are available to relieve stress like art of living, siddha samadhi yoga, forum etc., which are very beneficial. Actually, everyday, a self assessment is an important tool to achieve the target of stress control.

### **Self - treatment :**

In addition to the above mentioned solutions there are other measures that can be used in daily life without the help of others. There is no need to take a leave of 10-15 days, go to a hill station and spend a lot of money.

1. Go for a walk or enjoy cycling
2. Do some gardening, or go for a stroll in the garden
3. Play a game or two of tennis or table tennis
4. Write a letter, make a phone call or go for dinner with a friend
5. Spend some time on a hobby or a craft
6. Listen to music or learn singing or playing a musical instrument
7. Pray for at least 10 to 15 minutes twice a day. Prayer is a very big strength that has the power of making the mind completely healthy

8. Do not think of problems or difficulties but focus on finding solutions
9. Do some social service, spend time in an orphanage, meet friends and family members and take part in some group activity
10. Enjoy a film or a drama
11. Read a good book or a magazine, meet spiritual people and read religious books. Play with children for 15 to 30 minutes. Such innocent and happy moments are rare. Be like a child and play with them
12. Visit a museum or an art gallery
13. Take a massage, a facial, a bubble bath or a steam bath
14. Keep the phone aside, close the windows and lights, close your eyes and listen to music of your choice. At this time do not answer a phone call. Use an answering machine instead, and
15. Change your attitude for better. The mantra is to make it positive. Good reading, spiritual listening, and good thinking changes the attitude and if this happens a person can remain normal in any situation. Positive thinking is the surest way to remain happy and make people happy around you.

**Summary :**

Do nothing if you are stressed. Do not make any hasty decisions. Do Shavasana. Complete rest and deep breathing is perhaps the best solution. If possible do prekshadhyana, progressive relaxation, or learn and practise yoganidra. If suddenly some place or person causes stress, then it is

advisable to leave the place or the person. Go to a temple. Visit a friend. See your self in the mirror. Never react to anger. If you feel angry count loudly from one to ten, this is a well-established method of controlling anger. Salvaging that moment is the most important thing. After a little while the stress will calm down. Till then, if possible one can do meditation or **Shavasana**. In short, get away -from stress causing people or situations and prevent harsh reactions, focusing on noble thoughts, noble activities and learn to live happily. Also regular prayers, meditation, yoga, exercise, pranayam should be added to the lifestyle. Along with this, nutritious diet and fruits should be regularly consumed. Thus, change in life-style and positive attitude can certainly decrease stress and provide enough courage and strength to face unavoidable stress amicably.



By now, it would be clear that brain and nervous system are very important and delicate. Its functioning is also very different. Damage to different parts of this system causes different group of symptoms, which can be diagnosed with the help of medical examination as well as investigations like M.R.I, CT Scan, E.M.G., blood tests, lumbar puncture test etc. One can take the help of a neurophysician (or an experienced physician) for this. These doctors treat these diseases mainly with drug therapy. But in cases where these medicines cannot cure the disease or where there is a tumor in the brain or spinal cord, compression of the spinal cord, obstruction in the blood vessels or an accidental injury to the brain or spinal cord, surgery becomes imperative and the services of a neurosurgeon are required. Thus the surgery of the nervous system includes the surgery of the brain, skull, vertebrae, spinal cord, nerves and the blood vessels supplying blood to the brain.

As mentioned earlier all these organs are very delicate and so they are well protected by nature. Thus their surgery requires expertise, caution and alertness. Once damage occurs to these organs it can not be repaired. In some diseases there is no role of treatment by drugs. Like in some cases of brain tumor, there is no other option except an operation, whereas in some other cases, treatment has to be done by combination of both medicines and surgery.

**Some of the diseases that require Surgery are listed below (There are other indications of surgery also) :**

1. Injury of the brain or spinal cord (through accident or some other way).
  - Fracture of the skull or vertebrae,
  - Extradural or subdural hematoma (blood clot in the membranes of the brain),
  - Contusion of the brain or spinal cord, and
  - Secretion of CSF from the nostrils (CSF Rhinorrhea).
2. Infection of the brain :
  - Abscess,
  - A large TB tumor (Tuberculoma), and
  - Enlarged ventricles of the brain (Hydrocephalus).
3. Tumors of the brain or spinal cord :
  - Simple tumors like meningioma, neuroma, epidermoid, dermoid, tumor of the pituitary gland, and
  - Cancerous tumors like glioma, metastasis.
4. Abnormality or defects in the blood vessels :
  - Ballooning of the blood vessel (aneurysm)
  - Entanglement of the blood vessels (AN. Malformation)
  - Obstruction of the carotid artery due to Plaque formation (stenosis) and
  - Brain hemorrhage.
5. Congenital defects :
  - Abnormal development of the skull (craniostenosis)
  - Hydrocephalus



- Congenital tumor in the brain
  - Exposure of the spinal cord due to defects in the vertebrae (meningomyelocele), and
  - Craniovertebral anomaly.
6. Degenerative diseases of the nervous system :
    - Damage to the cervical or lumbar vertebrae (disc prolapse).
    - Lumbar canal stenosis (lack. of space between lumbar vertebrae).
  7. Compression of the nerve, like carpal tunnel syndrome or nerve repair in case of the nerve trauma or nerve transplant surgery.
  8. Functional neurosurgery for Parkinsonism, seizures etc.

### **Basic information :**

It is very correct to say that before going in for any such surgery absolutely accurate diagnosis is a must. It is the duty of the neurosurgeon to inform the patients and his relatives how much the patient is likely to benefit from the surgery. Risk factors involved in the surgery if any, should also be explained. Though in our system the diagnosis and the decision of the need for surgery is mainly in the hands of the neurophysician, still it is necessary that before surgery, the neurophysician and the neurosurgeon discuss the case and if there is any doubt further investigations may be done to confirm the diagnosis, and surgery attempted only after full satisfaction regarding the diagnosis.

There are various methods of operation. Due to innovations in anesthesia, it can be said that there is no risk

of life, even in the elaborate and complicated cases where there used to be a danger of life during surgery earlier. However, it is not incorrect to say that the brain surgery is comparatively more dangerous than other surgeries. The brain surgeries last approximately for 2 to 4 hours, but sometimes it may also go on for 16 to 20 hours or more. After obtaining a fitness report for surgery from the physician, usually the anesthetist examines the patient to ascertain whether the patient can withstand anesthesia. However, if there is a fear of impending death and not much time is available, neurosurgeons ignore everything and perform emergency surgery in spite of the risk for the sake of humanity. For example, when there is a brain hemorrhage in a road accident and emergency operation is inevitable.

These operations are also of different kinds. Surgery is done on the organs according to the disease. The planning of surgery depends upon the organ to be approached.

1. If the aim is to reach only the outer membrane of the brain a hole called Burr-hole is drilled in the skull. This is done in subdural haematoma.
2. The surgery where a part of the skull is cut open is called craniotomy and craniectomy. The brain can be approached through this opening directly.
3. Opening the vertebra partially is called hemilaminectomy. If the vertebra is opened completely it is called laminectomy, etc...
4. A minor surgery can be performed, by drilling a hole in the vertebrae.

As mentioned earlier, the brain and the spinal cord are very sensitive and delicate parts of the body are therefore

well protected. In order to reach these parts special instruments need to be developed. From well-equipped operation theatres to appropriate operation tables and proper lighting arrangements are essential requirements. Many operations can be done better with the help of microscopes. In order to drill holes swift drills, quality retractors and cautery (to stop bleeding) are vital.

Rapid acting ultrasonic systems are used to dissolve various tumors. During surgery also, monitoring by ultrasound can pinpoint the exact location of the defect deep inside the brain.

The stereotaxis instruments help in the biopsy and removal of tumors deep inside the brain and spinal cord.

The stereotaxis method has worked wonders in disease like Parkinsonism, Epilepsy etc. Without opening the skull, through a Burr-hole in the brain, using a needle and an electrode that penetrates deep into the brain, various very complicated diseases can be treated easily.

Microsurgery gives excellent results in epilepsy, especially in temporal lobe epilepsy. Similarly, the stereotaxis surgery can also be used for epilepsy. Vagal stimulation is also a similar minor procedure in which microelectrode and a stimulator can be used to stop the electrical storms taking place in the brain with the help of computerized methods. Apart from this, if necessary major surgeries like lobectomy, hemispherectomy, corpus callosotomy etc can be done. Various other surgeries like the transaction surgery where an impulse can be prevented from passing from one neuron to another can also be done.

### **Laser :**

It seems that the utility of laser will increase day by day. Laser is the option of cauterizing the organs, which cannot be excised. The proton beam is also a similar method, with which AV malformation can be cauterized.

### **Radio Frequency Lesion generator :**

This technique has been proved very effective in Trigeminal Neuralgia and other such painful diseases and also in movement disorders like Parkinson's disease. As the name suggests, relief is obtained in the disease by using radio frequency current to block the functioning of a nerve or to cauterize it.

### **Gamma knife and Linear Accelerator :**

This method is becoming increasingly popular to treat tumors or other such diseases without resorting to surgery. It is available only in few places in India as it is very expensive. But the risks of surgery can be avoided to a large extent. There is an element of failure in it too. This procedure is very popular for treating benign tumors like Meningioma, Schwannoma. Its expenses range from one to two lakhs.

### **Endoscopic Neurosurgery :**

This is also a kind of minimally invasive surgery, which means that without opening the brain completely, the diseases located deep inside the brain especially tumors or aneurysms are tackled. This reduces the risk of surgery considerably but conducting the surgery from a very small opening with a microscope requires profound experience. This procedure is extensively used in the third or fourth ventricle tumor, aneurysm, etc. The surgery can be compared to the "beating heart surgery" of the heart.

Similarly, the surgery is done through operating microscope, removing only the damaged part intricately with expertise. This prevents the surrounding areas from getting damaged. This surgery is a time consuming procedure and requires patience and expertise, e.g. surgery for temporal lobe epilepsy.

Now-a-days our surgeons have gained expertise in conducting “Awake Craniotomy” in which no anesthesia is used and the patient is operated upon in a fully conscious state.

When the disease has spread beyond limit, surgeons just remove a part of it and feel the satisfaction of having helped the patient. When it is not possible to remove the entire tumor and there is a danger that the patient may die on the operation table or surgery may paralyze a major portion of the body, it makes sense for the doctor to excise some part of the tumor so that the patient can feel better and survive a little longer. This is known as palliative surgery.

**Thus, there are three kinds of neurosurgeries :**

1. **Resective surgery** : as far as possible the damaged parts are excised.
2. **Palliative Surgery** : In this, as mentioned earlier, partial removal of the tumor is done.
3. **Functional Neurosurgery** : In ‘this there is not much h of : excision involved but the nonfunctional parts are made to function in a different way. If necessary grafting of new cells or putting a stimulator in the brain, injecting chemicals or drugs or making newer paths through small openings can be done.

It is quite gratifying to inform that all these surgeries are now available in India and 90 % of these surgeries are also done in Ahmedabad. In major cities like Mumbai, Delhi all types of surgeries are available and the world-renowned doctors having the best of education and expertise are available to serve the patients, and that is the pride of our nation.

In majority of operations the risk factor is 2% to 4% at good centres, but if the patient is aged and suffers from diabetes or heart disease or blood pressure or the operation has had to be done in an emergency, the risk may go up to 10% to 20%. If the surgeon or the anesthetist feels that the risk is high, it is advisable to avoid surgery and treat the patient with medicines only. If the relatives of the patient insist on taking a chance, the surgeon can perform surgery on consent. Like in brain attack, if there is hemorrhage with a lot of swelling and if the prognosis is very bad, the skull can be opened so that the brain can swell outside or attempts are made to suck out the hemorrhage, so the chances of saving the patient's life compared to certain death can be calculated as S to 25%. If the operation is successful, eventually the patient is given discharge. Usually, the patient can go home in six to nine days. However, in risky surgeries it may take more time to give a discharge. After being discharged, special attention is given to the fact that the patient becomes ambulatory as soon as possible.

Physiotherapy is started during hospitalization itself and is continued even after the patient goes home till he gets completely cured.

After the surgery, the follow up by neurosurgeon and neurophysician are again required for the rest of the treatment.

Many patients can be completely cured while some get relief by Surgery. In some cases, after the surgery also, drugs have to be continued for a short or long period of time. Before surgery, as MRI and CT Scan are done to confirm the diagnosis, after the surgery also in order to ascertain the result, in some cases (specially in the cases of tumor) post-operative CT Scan or MRI is essential. In all these procedures the patient and the relatives find themselves confused. They are also plagued by financial and social problems. Therefore, the best option is to discuss all the aspects of the surgery frankly before and after the surgery and the doctor should also give a clear picture right from the beginning. This difficult mission can be accomplished with mutual trust, love and co-operation.

Thus, the field of neurosurgery is not just limited to the neurosurgeons. It requires the teamwork of the neurophysician, the neurosurgeon, the physiotherapist, the occupational therapist and the physician. This alone can help in comprehensive and definite treatment of the patient.

It should be realized that the expenditure in each case differs according to the case. The kind of disease, severity, necessity of an emergency surgery, experience of the surgeon, the place where the surgery is done, how well equipped is the hospital, the risk of anesthesia (like in the aged patients as well in diabetic and heart patients the risk is more) and many other such factors determine the cost. In foreign countries most of the expenses are being borne by the insurance agencies, so the patient or the doctors do not have to waste time and energy on these matters.

We hope that our society also awakens in this matter.



# 23

## NEUROLOGICAL MEDICINES TO BE USED FOR LONGER DURATION.

We have seen in the previous chapter that many neurological disorders are very difficult and their treatment has to be continued for a long period like 6-12 months or in some diseases even lifelong. There are benefits as well as side effects of these drugs. If there is proper knowledge about these medicines, many a problems/worries can be resolved timely.

The purpose of this chapter is to impart correct information regarding the effects as well as the side-effects of these drugs, but here it needs to be stressed that taking any medicine without consulting the doctor is very dangerous and so all these medicines should be taken under the supervision of the doctor. Self-medication should be avoided

### **Steroids :**

Steroids are used in some important, stubborn and acute diseases of neurology. These medicines are like a double-edged sword, i.e. if they are used in a proper way, in proper dose, for an appropriate period they give excellent results, save life and help in complete recovery from the disease which no other drug may be able to achieve. But if these drugs are taken inappropriately, in wrong doses without a doctor's supervision for a long time, many serious problems can occur. The worst part is that these drugs have frequently been misused and abused instead of being appropriately used.



In fact, steroids are a group of endocrine hormones produced naturally in the adrenal gland with the help of vitamin C, e.g. corticosteroid, mineralo corticoids. Steroids play the major role in regulating the functions of the various glands, organs and systems of the body, development of immunity and fighting against stress. So, it can be comprehended that in the serious diseases occurring due to the defi of steroids, it is imperative to give synthetically prepared steroids. In neurology, appropriate use of steroids can give desired results in diseases ranging from low blood pressure to myasthenic crisis, cluster headaches to brain edema etc. In some neuropathies, demyelinating diseases (multiple sclerosis), brain tumor, polymyositis, some cases of T.B. meningitis, and many other diseases steroids are required.

The main steroids are prednisolone, dexamethasone, and methyl prednisolone. They are available in the form of tablets, injections or liquids. Abuse of these drugs can result in very serious consequences.

#### **Side Effects of Long-Term Use, of Steroids :**

1. Acidity (burning sensation in stomach and chest) and ulcer formation or worsening of previous ulcers in the stomach.
2. Increase in blood sugar and diabetes
3. Increase in blood pressure
4. Fungal infections occur rapidly resulting in candidiasis and ringworm infestation.
5. Lipid abnormalities may occur
6. Excessive hunger, insomnia, and irritability

7. Bloating of the body, excessive weight gain, and accumulation of fat on the face, stomach and back of the neck
8. Difficulty in getting up from the floor due to weakness in muscles of waist
9. Softening of the bones results in pain in vertebra and back
10. Weakening of the hipbone causes pain and in some cases fractures may occur necessitating surgery
11. Delayed wound healing
12. Infections like T.B., herpes etc can be contracted easily
13. Urinary infection
14. Inflammation can occur in pancreas
15. Potassium levels in blood may reduce, and
16. BP may fall at an alarming rate due to abrupt withdrawal of steroids.

Because of all these reasons, steroids are prescribed in a high dose only for a few weeks. However, in some diseases very less result is seen on short-term administration of steroids and, therefore, they may have to be continued for a long period. In such cases regular advice from the doctor is essential. Supervision of a specialist with continuous laboratory monitoring is also important. In order to prevent the side effects of steroids (in long-term steroids course), the doctors regularly prescribe calcium, potassium, vitamins and diuretics (to prevent edema) in proper doses. Advice is given to protect the patient from infections. Proper guidance regarding diet is also provided. At regular intervals

check - up for diabetes, calcium, blood potassium levels, blood pressure etc is done by the specialist and the patients should give full cooperation for the same.

In addition to this, many medicines are used for a long period of time in neurological cases like epilepsy (fit), headaches, parkinsonism etc. A few of these will be described in brief.

### **(A) Epilepsy (Fit / Seizure)**

#### **1. Diphenyl Hydantoin**

In rare cases this medicine can cause a serious allergic reaction, known as **Steven's Johnson syndrome** which starts with erythema on skin and fever endangering life. The common side-effects of this drug are inflammation of the gums, regression of the beauty and softness of the face, unwanted hair growth, decline in memory, enlarged lymphnodes in the neck, damage to the small brain (cerebellum), or minor problems of the nerves. If the dose is high, the patient experiences double vision and vertigo. Therefore, it is important to monitor the levels of the drug in the blood regularly. This is known as "Phenytoin Blood Level". Blood for this test has to be taken on a fixed time just before dose or else it is useless. If possible pregnant patients are shifted to some other drug, because 0.7% children are born with deformities due to this drug.

#### **(i) Carbamazepine :**

This medicine can also cause the earlier mentioned rare Steven's Johnson syndrome, which is a life-threatening allergy of skin and mucous membrane. In addition to that, white blood corpuscles particularly neutrophils can decrease causing ulcers in the tongue and throat and infections can

occur. Therefore, the patients using this drug should regularly get their blood tested for various blood cell levels every three to four months. This medicine is harmless during pregnancy and there is no evidence of side effects to the child.

**(ii) Valproic Acid :**

This medicine is used in many types of epilepsy. It commonly causes weight gain and hair loss, but it can also damage the liver and so if this medicine is being taken, regular blood test called S.G.P.T. should be done every 3 to 4 months, though there are a few disparities in this advice, e.g. the S.G.P.T may ha<sup>ve</sup> been normal a week ago and suddenly the liver starts malfunctioning. If the symptoms point out to this the drug may have to be stopped after conducting the blood test again and confirming the clinical findings. If a pregnant woman takes this drug there are reports of damage to the spinal cord of the baby, though the proportion is in 10 babies out of every 1000. The presence of this defect can be ascertained by sonography, blood test called alpha-fetoprotein, or amniocentesis and if a problem is detected the pregnancy should be terminated.

**(iii) Phenobarbitone :**

This medicine is old yet very effective but medical reports show that if it is given to small children for a long period, they may become stubborn and mischievous and in some cases there can be memory defects. It also causes drowsiness and so this drug is used very infrequently these days. Instead of this drug, another slightly different drug called eterobarb is used in Europe, which has fewer side - effects.

**(B) Side-effects caused by medicines of Parkinsonism :**

The drugs for this stubborn disease also have to be taken lifetime, -and therefore, it is wise to note the side- effects.

**(i) T.H.P.H. (Padtane) :**

This medicine is problematic for patients of more than 65 years of age. It is a known fact that this drug can cause retention of urine, confusion, memory defects etc. Therefore, this medicine is usually given to patients before age of 60 years, who do not have problems of prostrate.

**(ii) Levodopa - Carbidopa :**

This drug famous as Sinemet, Tidomet, Syndopa etc. is the basic drug for Parkinsonism. But the patients with heart trouble need to use this medicine cautiously. While on this medicine, it happens quite often that the patient may try to get up suddenly and fall adown due to sudden drop of blood pressure; this is known as postural hypotension. Long-term use causes abnormal movements of the limbs called dyskinesia, dystonia and chorea. If this happens the medicine has to be given in a different form, changed or eventually surgery has to be resorted to.

**(iii) Amantidin :**

Originally used for influenza; accidentally in 1934 it was discovered that it is also beneficial in Parkinson's disease. It has been proved very effective drug again and again. But it can also cause side - effects like skin diseases in the feet (Livedo reticularis), heart problems, swelling in legs, mental confusion, depression etc. and therefore the medicine has to be discontinued off and on.

**(iv) Bromocriptin :**

This is an effective medicine but if taken in excessive dose nausea-vomiting, low BP etc can occur and long term usage causes confusion, hallucination, swelling of legs, redness and other such peculiar problems.

Latest medicines like Pramipexole, Ropinirole, Tolcapone, Entacapone, etc have lesser side effects and are comparatively more effective. But they are not yet manufactured in our country and are therefore expensive. Long term side effects are yet to be ascertained, as these drugs have not been around for a long period. Ropinirole is now available in India.

**(C) Other medicines :**

(1) Extensively used medicine is aspirin, which is primarily used lifelong by neurologists in preventing paralysis, thinning of blood, and if used optimally, it is very beneficial. But a few cases of death due to serious allergy have also been recorded. Nausea, vomiting, acidity, are common side-effects and peptic ulcer can also lead to vomiting of blood. Long-term use can cause excessive bleeding and other side effects. So the doctors have to be very cautious. Another medicine to prevent paralysis is Ticlopidine. Usually in 2% to 3 % of cases decrease in blood white cells occurs apart from allergy, stomach upset, diarrhoea etc. In addition to this in some specific cases oral anticoagulant (Warfarin, Acitrom) drugs are also given to prevent coagulation of the blood. In these cases, every 7 to 15 days Prothrombin Time with INR (a blood test) is necessary to determine the extent of the thinning of the blood because if the Prothrombin Time

increases over a limit, hemorrhage can occur and there are many instances of death due to hemorrhage, due to improper supervision and lack of compliance.

**2) Headache - migraine:** If a beta blocker propranolol (Inderal, Ciplar), prescribed extensively for prevention of migraine and high blood pressure is given to an asthma patient, it can cause an attack of asthma. It can also lower the blood pressure and the heart beats. If this drug is taken in a large dose for a long time it can cause impotence in men and the circulation of blood in the legs is compromised. The doctor should also see other side-effects. The other effective medicine used in migraine is Flunarizine. Its long-term use leads to depression, Parkinsonism, weight gain, hair loss. In females menstrual cycle can become irregular.

**3) Antibiotics :** These drugs have proved to be lifesavers in life threatening diseases like meningitis of the brain. If they are used appropriately in proper dose. But now-a-days it has been observed that these medicines are being used inappropriately and in improper doses in very simple diseases and in most cases unnecessarily. Many of these antibiotics damage the liver and kidneys e.g. drugs like Amino glycoside. Some antibiotics spoil the hearing capacity and cause imbalance (streptomycin). Sometimes the blood becomes too thin and bleeding may start (Cephalosporin), occasionally, penicillin group of antibiotics may cause a severe reaction a few minutes after being injected and the patient may die right in presence of the doctor. Penicillin tablets or ointments can also cause such allergic reactions. Therefore, before prescribing penicillin

and such other medicines it is essential to ask the patient whether he has suffered from such an allergy in the past. These antibiotics should be used only where they are required and before administering a full dose, a test dose is given on the skin and if there is no reaction within half an hour then the full dose is given. Fortunately, such cases are very rare. Unnecessary use of antibiotics leads to resistance and after that only higher drugs have to be used.

**4) Quinine :** Quinine is used for treating falciparum malaria It can cause serious side effects like whistling in the ears, weakness, vertigo, confusion, seizures or black water fever. Fortunately such circumstances occur rarely. Getting the. blood tested for G6PD is very beneficial before administering quinine.

Finally, once again I would like to draw your attention to the fact that the above mentioned drugs should never be taken without medical advice and supervision The above mentioned particulars are only for the sake of information, which I personally feel can save life.





# 24

## TIPS FOR A HOSPITALISED PATIENT

Once the patient is admitted to the hospital for neurological or other diseases there are various duties of the family members for proper care of the patient. Especially if the patient is unconscious, the condition is very serious or is extremely weak at that time; special care is very essential.

If the relatives of a hospitalized patient are aware of the following information regarding the various treatments, it can be very helpful during patient management. Only highly specialized metropolitan hospitals have adequate staff and appropriate care facility. Elsewhere, if following instructions are strictly followed by relatives, several lives can be saved.

### (1) Oxygen – O<sub>2</sub>

As and when the patient requires, oxygen has to be given continuously or every alternate hour. It is essential to supervise that the nasal tube is in place. The bubbles in the bottle kept besides the oxygen cylinder indicate that the patient is getting oxygen. Thus, an eye should be kept on this bottle. The hospital staff should be informed before it becomes empty. Now-a-days, in many city hospitals oxygen is supplied through a central line, where such supervision is not required.

### (2) I.V. fluid

If the patient is being given I.V. fluids the relatives should take care of the following points:

- (i) Care should be taken by the relative that the patient does not move the hand or foot where the I.V. needle is injected

- (ii) It can be so arranged that exact number of drops of the fluid per minute comes from the bottle. If there is any problem nurse should be informed immediately. If the fluid stops or leaks or the speed of the fluid falls or increases or there is a swelling or redness in the place where the needle is injected or the patient feels cold or shivering occurs or gets fever the attending nurse/staff should be immediately informed.

**3) The nasal feeding tube (Ryle's tube) is inserted into nose of the patient.**

- A nurse normally does the job of feeding through this tube. If the relative of a patient has to perform this function, he should understand the procedure very clearly.
- The feeding is started only after permission of the doctor.
- For nasal feeding tea, milk, coffee, lemon water, coconut water, electral powder water, liquidized rice, khichdi, protein powder or ready made packets for energy-calorie like Recupack, Tenolip, Tenotube, Nourish powder, filtered dal soup, vegetable soup or fruit juice - fruit shake etc., liquids should be given in a fixed quantity at regular intervals as per the doctor's advice. As instructed, one should give these liquids in the quantity decided by the doctor every 2 to 3 hours and a note of the same should be maintained for the doctor's information.

- While the liquid is being given through the tube and in case the patient starts coughing or becomes breathless, the feeding should be immediately stopped and the doctor should be informed immediately.
- Before starting a feed, every time first a fluid from the stomach has to be sucked with a syringe to ensure that the feed can be given, if the amount of liquid is more than 50 c.c feeding should not be given. After an hour repeat the procedure to confirm and then only feeding is started. If the withdrawn fluid is red or coffee colored, the doctor should be informed immediately.
- After feeding any liquid, the tube should be thoroughly cleaned with 10- 15c.c of water.
- It is essential to replace the tube at every 15 days.
- If the patient remains unconscious or semiconscious for long, Ryle's tube (nasal) feeding can be problematic, it may lead to aspiration pneumonia (i.e. infection in the lungs). This is one of the five main causes of death in an unconscious, patient. Under these circumstances gastrostomy tube feeding is preferable. This is done through a small cut in the skin over the abdomen, a special long - lasting tube is inserted into the stomach. If the patient is likely to remain unconscious for more than 1-2 weeks the hazards of nasal tube feeding can be averted with such gastrostomy tube insertion, which can save life of the patient.

#### 4) **Tube for Urination (Catheter).**

One should make a note of the total amount of urine passed by the patient during 24 hours and this should be reported to the doctor.

- If the patient passes more than 2500ml or less than 1000ml urine in 24 hours or if the urine is extremely yellow (turmeric color), red or white because of pus, the doctor should be informed.
- The quantity of urine passed every hour should be observed. If it seems to be reducing, the doctor or nurse's attention should be drawn towards it.
- Usually, if the catheter is indwelling then it should be changed at every 15 days, and if the catheter is not indwelling (outside) then it should be changed at every third day.
- However if silicon (silastic) catheter is used, it can be kept for a longer period.
- The cathetered area should be cleaned and dressing should be done carefully.

#### 5) **Motion :**

It is better that the patient voids his bowels everyday. If the patient does not pass stool for more than two days the doctor should be informed. As per doctor's advice, some drug through 'the feeding tube or enema or suppository via the anus should be used carefully.

#### 6) **Eye care :**

If the eyes of the unconscious patient always remain open they can become red and an ulcer may develop on delicate cornea and eyesight can be lost. Therefore, the eyes should

be covered with pads according to the doctor's advice and appropriate eye drops like Moisol can be used or if found necessary antibiotic eye drops should be instilled in the eyes.

### 7) **Mouth Care :**

To avoid ulcers and thrush in the mouth, the mouth should be checked everyday. Medicated glycerin and mouth fresheners should be used twice a day. The tongue should be cleaned with a tongue cleaner. Cleaning the teeth is very important. If the patient is conscious, gargles should be done.

### 8) **Physiotherapy :**

Sometimes the patient has to keep exercising for a long period. In order to continue these exercises at home, complete information regarding these should be obtained from the physiotherapist or a doctor. The types of exercise, timing and duration should be noted and religiously adhered to.

- a) If the patient has paralysis, exercises should be done accordingly for the paralysed part,
- b) If the patient is unconscious, every two hours the limbs should be given passive exercise for fifteen minutes,
- c) Usually, the exercise is done 4 to 8 times a day, for 10 to 30 minutes, without tiring the patient, and
- d) If there is a swelling or redness in the legs of the patient, the doctor should be informed. Sometimes it can be a sign of a very dreadful disease-Deep vein thrombosis (DVT).

### 9) **Removal of Secretions from the Chest (Suction).**

When the patient is in the lying position for a long time, respiratory problems may also arise. The chest becomes congested with cough and sounds can be heard in the chest. This can cause pneumonia. It also hampers the process of

breathing. For such patients suction is done frequently with a thin tube to clear the respiratory passage. This process is usually done by the hospital staff, but can also be done by relatives who are aware of the procedure. Actually use of disposable catheters for this purpose is more appropriate.

If the patient has breathing difficulty and excessive cough formation (expectoration) or if the patient is unconscious then Portex endotracheal tube is inserted through the mouth or nose in to the trachea (wind-pipe). This can be left in place for 7-14 days.

### **Tracheostomy :**

With this, suction of secretions becomes easier and patient can breathe better. If there is no improvement in the level of consciousness or excessive cough continues to accumulate in the lungs; doctors usually decide to perform tracheostomy. In this procedure a small hole is made in front of the neck on the windpipe and a plastic or metal tube is inserted into it, so as to facilitate the breathing process. The secretions accumulated in the respiratory tract can be easily removed through suction and the risk of pneumonia is minimised. It also improves the patient's breathing. When breathing starts improving, level of consciousness improves and secretions decrease, then gradually the diameter of the tube can be decreased, thus decreasing the size of the hole. With time tracheotomy wound close and healing starts.

In order to avoid secretions from accumulating and thereby preventing hypostatic pneumonia and maintain normal breathing, chest physiotherapy should be initiated early. Appropriate drugs and steam inhalation may be given through nebuliser. This keeps the airways patent clean and warm.

## 10) Nursing Care :

- The patient's bed should be kept clean and wrinkle free. The bed should be arranged in such a way that the patient's head is 15 to 20° higher. If necessary powder should be sprinkled on the bed. Relatives should avoid sitting on this bed as far as possible.
- If the patient is unconscious, he should be made to lie in such a manner that his head remains 30 to 40° higher than the body.
- The patient should be kept in a lateral semi prone position and the side should be changed every few hours. This precaution is essential to prevent formation of bedsores and aspiration pneumonia.
- It is necessary to take constant precaution that the patient does not get bedsores or ulcers. If the color of the skin changes or abrasions are seen the doctor and the nurse should be informed.
- If the patient is completely bed ridden for a long time due to longstanding disease, it is necessary to use a waterbed or an airbed. According to the doctor's advice, arrangements can be made to lay the patient on a waterbed. Sometimes airbed or sponge bed can also be used.
- The patient should be given a sponge bath daily. Eau-de cologne should be applied to skin.
- The patient's face should be cleaned twice a day by the nurse. The relatives of the patient can also do this twice.
- If the patient is conscious, he should preferably be fed in a sitting position.

### **11) Vital Points :**

- 1) If the patient's heartbeat or pulse becomes faster, the doctor should be, informed immediately. It is advantageous if the relatives of the patient learn to read the cardiac monitor.
- 2) If the respiration of the patient seems to be faster or the patient suddenly becomes pale or turns blue, the doctor/ nurse should be informed immediately.
- 3) The doctor's/nurse's attention should be drawn if there is high fever and cold sponging should be started. Somehow brain takes fever in a very unfavourable way.

### **● Special Duties of the Family Members :**

- a) There are numerous factors that play an important role in curing the patient. The care and attention given by the relatives is very important. Along with the treatment love and affection too can have magical effect. This increases the will power of the patient, which gives an inner strength to get cured.
- b) In the hospital the relatives should arrange regular duty, in staying with the patient day and night and maintain a constant vigil. The patient should never be left alone. If left alone, there could be a possibility of the patient falling off the bed. If necessary a railing could be provided on the bed.
- c) The patient requires calm and rest and therefore talking loudly near his bed or making noise should not be allowed.
- d) The room should be kept clean.



- e) Too many people should not be allowed to crowd around the patient. This can increase the possibility of the patient catching an infection. Sick relatives who come to meet the patient should be kept away with due regards.
- f) Visitors should not talk about diseases, death or other shocking incidents in the vicinity of the patient. Such talks can lower the will power of the patient. Care should be taken that such people do not go near the patient.
- g) Similarly, discussions about ill experiences related to disease, medicine, doctor or dispensary, superstitious beliefs, etc should not be done in the presence of the patient or relatives. Predictions about the patient's disease, whether the medicines given to the patient are proper, whether the doctors are good- etc topics should be avoided. Due to this the patient and the relatives can become confused, which can create, a problem in patient's treatment and health.
- h) It's most important to change the pattern and manners while visiting the patient and the environment in the hospital should be changed. Things like offering fruits, flowers, books, get well soon cards for the patient can be done to convey well wishes. Cassettes of the patient's favorite music can be played in a low volume. Prayers for the patient can be done at a holy place or home; the patient can also be convinced to pray.

**Prayer has 'a tremendous strength to cure.**

- i) Unfortunately, there is not much awareness amongst our people about the practice of medical insurance and on the other hand medical treatment is getting expensive day by day. In a situation where the patient is not insured and financially not in a good condition and requires financial support for the treatment, the doctor's attention should definitely be drawn towards this. With the doctor's guidance medicines can be obtained at subsidized rates from various social organizations. Many such organizations work in the big cities. The social workers of the hospital can guide the patients at such a time.
- j) Many diseases require special, intensive and expensive treatment like plasma exchange in AIDP, gammaglobulin in AIDP or myasthenia gravis, ventilator support etc. The cost of these therapies may range from Indian Rupees 50,000 to 4 lakhs (400 Thosunds). The doctor might be able to help in providing medicines at concessional rates. Information regarding financial help for the treatment in such cases may also be available from the doctor or medical social worker (MSW).



# Patient Information Guide

**AMYOTROPHIC LATERAL Sclerosis (ALSA)**  
 Amyotrophic Lateral Sclerosis Association (ALSA)  
 21021; Ventura Boulevard, #321  
 Woodland Hills, CA-91364  
 Contact Person: Michael Havlicek, President & CEO  
 Phone: 818-340-7500  
 Fax: 818-340-2060

**COMA**  
 Coma recovery Association, Inc.  
 570, Elmont Suite -140  
 Contact Person: Florence Manginaro  
 Phone: 546-355-0951  
 Fax: 546-355-9061

**ALZHEIMER DISEASE**  
 Alzheimer's Association  
 919, North Micheigan Avenue, Suite-1000  
 Chicago, IL - 60611-1676  
 Toll Free: 800-272-3900  
 Phone: 312-355-8700  
 Fax: 312-355-1110

**CEREBRAL PALSY**  
 United Cerebral Palsy Association  
 1660-L, Street NW, Suite -700  
 Washington, DC-20036  
 Toll Free: 800-872-5827  
 Phone: 202-776-0406.  
 Fax: 202-776-0414

**AUTISM**  
 Autism Research Institute  
 4182, Adams Avenue  
 San Diego, CCA-92116  
 Contact: Barnard Rimland,  
 Ph.D. Phone: 619-281-7165  
 Fax: 619-563-6840  
 Web Site: <http://www.autism.or/arig>

**EPILEPSY**  
 Epilepsy Foundation of America (EFA)  
 4351, Garden City Drive  
 Landover, MD-20785-4951  
 Toll Free: 800EFA-1000  
 Phone: 301-459-3700  
 Fax: 301-577-4941  
 Email : [Vostmaster@efa.org](mailto:Vostmaster@efa.org)  
 Web Site: <http://www.efa.org>

**ATTENTION DEFICIT DISORDER**  
 Children and Adults with ADD(CHADD)  
 Association for the Study of  
 National office,  
 499NW 70<sup>th</sup> Avenue, Suite - 101  
 Plantation, FL-33317  
 Toll Free: 800-233-4050  
 Fax :954-587-4599  
 Web Site: <http://www.chadd.org>

**INDIAN EPILEPSY ASSOCIATION**  
 Secretary General - Dr. V. S. Saxena  
 Sannidhi, K-i0J10 DLF City-II  
 Gurgaib, 122002.  
**INDIAN EPILEPSY SOCIETY,**  
 C-1/10, ARMS Campus  
 Ansari Nagar  
 New Delhi. 110029.

**BRAIN TUMOR**  
 American Brain Tumour Association  
 2720, River Road, Suite-146,  
 Des Plaines, IL-60018  
 Toll Free: 800-886-2282  
 Phone: 847-827-9910  
 Fax: 847-827-9918  
 Email : [abta@aol.com](mailto:abta@aol.com)  
 Web site: <http://pubweb.acns.nwu.edu>  
 -Iberko/abta htmUabtal.html

**HEADACHE**  
 American Association for the study of  
 Headache (AASH)  
 875, Kings Highway, Suite-200,  
 Woodbury, NJ-08096  
 Contact Person: Linda Megillicuddy  
 Phone: 609-845-0322.  
 Fax: 609-384-5811  
 Email :  
[lmgillicuddy@aash.ccmil.compuserve.com](mailto:lmgillicuddy@aash.ccmil.compuserve.com)

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**MULTIPLE SCLEROSIS**

Center for Neurologic Study (CNS)  
1211, Sorrento Valley Road, Suite-H  
san Diego, CA-92121  
Contact Person: Gayle Bresnahan  
Phon : 619-455-5463  
Fax: 619-455-1713  
Web Site: <http://www.cnsonline.org>

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**NEUROPATHY**

The Neuropathy Association  
P.O. Box- 2255, Lenox Hill Station  
New York, NY-10021  
Contact Person: Mary Ann Donovan  
Toll Free 800-247-6968  
Fax: 212-305-3986  
Email : [info@neuropathy.org](mailto:info@neuropathy.org)  
Web Site: <http://lineuropathy.org>

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**MENTAL RETARDATION**

The ARC of the United States  
500, East Border Street, Suite-300  
Arlington, TX -76010  
Contact: Alan Abeson, Ed.D., Executive Director  
Phone: 817-216-6003, TTY: 817-277-0553  
Fax: 817-277-3491, Website : <http://llthearc.org>  
Email : [thearc@metronet.com](mailto:thearc@metronet.com)

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**PARALYSIS**

American Paralysis Association (APA)  
500, Morris Avenue  
Springfield, NJ-07081  
Toll Free: 800-255-0292  
Phone: 201-912-9433  
Fax: 201-912-9433

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**MUSCULAR DYSTROPHY**

Muscular Dystrophy Association (MDA)  
3300, East Sunrise Drive Tucson,AZ-85718  
Contact person: Program Services Department  
Phone: 520-529-200, Fax: 520-529-5300  
Email : [mda@mdausa.org](mailto:mda@mdausa.org)  
Web Site: <http://www.mdausa.org>

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**NATIONAL PARKINSON FOUNDATION, INC**

1501, NW 9thm, Avenue  
Bob Hope Road  
Miami,m FL - 3136-1494  
Toll Free: 800-327-4545  
Fax: 305-548-4403

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**MYOSITIS**

Myositis Association of America. Inc.(MAA)  
1420, Huron Court, Harrisonburg, VA-22801,  
Contact Person : Betty N. Curry  
Toll Free: 540-433-7686, Fax: 540-432-0206  
Email : [maainfo@shentel.net](mailto:maainfo@shentel.net)  
Web Site: <http://www.lm.colhhnab/maa.html>

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**PARKINSON'S DISEASE & MOVEMENT  
DISORDER SOCIETY**

6, Jasville,1<sup>st</sup> floor  
Opp. Liberty Cinema  
Marine Lines, Mumbai-400020

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**MYASTHENIA GRAVIS**

The Myasthenia Gravis Foundation of America  
(MGF)  
222, South Riverside Plaza, Suite-1540,  
Chicago, IL-60606  
Contact Person : Abigail McCulloch  
Toll Free: 800-541-5454,  
Fax: 312-258-0461

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**REHABILITATION**

National Easter Seal Society, Inc.  
230, West Monroe, Suite-1800  
Chicago. IL-60606  
Contact Person: Information and referral  
Toll Free: 800-221-6827  
Fax: 312-726-1494  
Web Site: <http://www.seals.com>

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**STROKE**

American Heart Association National Center  
7272, Greenville Avenue Dallas, TX- 75231-4596  
Toll Free: 800-AHA-USA-1  
Fax: 214-369-3685  
Web Site: <http://www.amhrt.org>

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