

## BRAIN /NEURO TUMOURS

A brain tumour or intracranial neoplasm, is an abnormal mass of tissue with cells growing and multiplying uncontrollably, seemingly unchecked by the mechanisms that control normal cells. There are more than 125 types of brain tumors officially recognized by the world health organization. Brain tumors can be either primary or metastatic.

Primary brain tumors are those arising from the tissues of the brain or it's immediate surroundings like meninges etc. They can be benign or malignant i.e., cancerous.

Primary brain tumors occur in around 250000 people a year globally, making up <2% of all cancer. Median age at diagnosis is around 55yrs and has a bimodal distribution with the incidence peaking in the 1<sup>st</sup> and 6<sup>th</sup> decade of life. In children, brain tumors are second only to Leukemias as a cause of cancer. Most common types of tumors in children are medulloblastomas, low grade astrocytomas, craniopharyngiomas and brainstem gliomas. In adults, the most common types include meningiomas and astrocytomas such as glioblastoma.

Metastatic brain tumors are those which originate elsewhere in the body ( most commonly lung cancer, breast cancer etc) and migrate to brain, usually through the bloodstream. These are malignant tumours.

Metastatic tumors to the brain affect nearly one in four patients with cancer. In the past, the outcome for patients with these tumors was poor, with typical survival rates of few weeks to months. But now, the more sophisticated diagnostic tools and innovative surgical and radiation approaches, have helped survival rates expand upto years; and also allowed for an improved quality of life in these patients.

### **Risk factors**

There are only two proven risk factors for developing a brain tumor -

- Exposure of head to X-rays - < 5% of brain cancers
- Disorders of immune system – congenital immune deficiencies, AIDS etc. These increase the risk of CNS lymphoma.

In addition, there are certain rare genetic disorders that may increase the risk of a brain tumor i.e., Li-Fraumeni syndrome, VHL disease, Neurofibromatosis I & II etc.

There are also several myths about the causes of brain tumors that have no solid data to support them. For example – the use of cell phones, head trauma, exposure to petrochemicals etc.

## Symptoms

Brain tumor symptoms depend on the area of the brain affected. These can invade and destroy brain tissue, put pressure on nearby tissue, increase pressure within the skull, cause fluids to accumulate in the brain, block normal circulation of CSF or cause bleeding.

Symptoms vary from person to person and include –

- Headaches – often the first symptom and is worse when you lie down or awaken
- Seizures
- Changes in mental function, mood or personality
- Changes in speech
- Changes in the ability to hear, smell or see, including blurred vision
- Loss of balance or coordination
- Weakness, often on one side of body
- Changes in the ability to feel heat, cold, pressure, touch etc.

Though the presence of these symptoms do not always mean that you have a brain tumor, it is important to discuss about them with your doctor.

## Types of Brain tumors–

The WHO classification of CNS tumours is the most widely accepted system for classifying CNS tumours. It lists approximately 100 subtypes of CNS malignancies in seven broad categories.

There is also a grading system developed by WHO that indicates a tumour's malignancy or benignity based on histological features under a microscope.

- Low Grade tumors –
  - Grade I – Benign, non-infiltrative and slow growing. Possibly curable by surgery alone. Long term survival is expected
  - Grade II – Relatively slow growing and somewhat infiltrative. These may recur as higher grade
- High Grade tumors–
  - Grade III – Malignant, infiltrative and tend to recur as higher grade
  - Grade IV – Most malignant and widely infiltrative with rapid and aggressive growth. Has rapid recurrence

The common types of brain tumors are discussed below :

**GLIOMAS** – Most prevalent type of adult brain tumor, accounting for approximately 75% of malignant tumours. These arise from supporting cells of brain, the glial cells. These are subdivided based on the type of glial cell of origin –

**Astrocytomas** – Most common gliomas, arising from astrocytes and more commonly seen in cerebrum. These include tumors with benign and malignant potential. Ex- Pilocyticastrocytomas (Grade-I), Glioblastomas (Grade - IV) etc. Glioblastoma multiforme is the most invasive tumor which tends to grow very rapidly and has a poor prognosis.

**Oligodendrogliomas** – Grade II/III

**Ependymomas** – Grade I-III

**MEDULLOBLASTOMAS** – Usually arise in the cerebellum and are most frequently seen in children. They are high grade tumors (Gr-IV), but usually responsive to radiation & chemotherapy.

**MENINGIOMAS** – Includes Grade I-III tumors, though most of them are benign. They arise from the membranes surrounding the brain i.e., meninges.

**PITUITARY ADENOMAS** – Large majority are benign and arise from the pituitary gland.

Other types of brain tumors include - Schwannomas , craniopharyngiomas, chordomas, haemangioblastomas, melanomas, lymphomas, rhabdoidtumors, germ cell tumors, peripheral nerve sheath tumors etc.

## **DIAGNOSIS**

If you have symptoms suggestive of brain tumor, our doctors will examine you and will ask you about your symptoms, lifestyle and family history.

One or more of the following tests may be used to diagnose brain tumors. Apart from diagnosing, they may also be used in assessing the response to therapy.

- Imaging Studies – Show an area that may be a brain tumor and includes CT, MRI or PET scans
- Biopsy –needed to diagnose brain tumor and also the subtype. It can be done by stereotactic needle biopsy or during surgery.
  - Surgery – all or a part of the tumor is removed.
  - Stereotactic needle biopsy – used if the suspicious area is in a place that makes surgery too risky.

- Further Molecular analysis is done to assess the prognosis of the tumors depending upon the grade and molecular type. This will aid in taking a tailored treatment decision.

In brain tumors, it is important to get the most accurate diagnosis possible. This will help the doctor to pinpoint the tumor and give the best treatment with least impact on your body.

In our hospital, we have the most experienced and renowned team of radiologists and pathologists and also the most modern and accurate equipment available to diagnose your condition with utmost accuracy.

### **Our treatment approach**

If you are diagnosed with brain tumour, our doctors will discuss in multidisciplinary tumour board with you the best possible options to treat it. This depends on several factors like the type of neoplasm, its location and your general health.

One or more of the following treatment options are recommended to treat your condition or to relieve your symptoms.

### **Surgery**

This is usually the first treatment offered to most patients. Maximal Safe Total resection of tumor is the goal. But, some tumors are located in areas which are difficult to access or remove completely without injuring important parts of brain. For the tumours in the critical areas Stereotactic Biopsy of the tumour is done for establishing the diagnosis and plan further treatment.

So, surgery helps in removal of tumor completely or atleast reduction of the size, thereby relieving the symptoms.

In our hospital, we offer the most skilled and well recognized team of neurosurgeons who perform large number of surgeries each year using the most sophisticated techniques like neuro-navigation with help of a Neuro-Radiologist.

### **Chemotherapy**

Omega hospitals offer the most up to date and advanced chemotherapy options for the treatment of brain tumours. These drugs can be taken orally or by injection.

Chemotherapy may not be as effective in brain malignancies as in other cancers. This is due to the presence of blood brain barrier and small blood vessels in brain. It is more beneficial in certain types of paediatric tumors, lymphomas and some oligodendrogliomas etc.

### **Radiation therapy**

Radiation therapy involves the use of high energy X-Rays in the range MeV to kill, stop or slow the growth of neoplastic cells. It can be given alone or in conjunction with surgery and/or chemotherapy as a primary treatment and also for tumors which have recurred following primary treatment.

**Types of radiation delivery** – depends on a variety of factors like type of tumor and its location, its size and the number of lesions etc.

These include –

3D-CRT – Three dimensional conformal radiation therapy is a technique where the radiation beams are shaped to match the tumour as closely as possible with the help of beam shaping devices like Multi-leaf collimators etc. This helps in delivering higher doses of radiation to the target while sparing the adjacent normal tissue.

IMRT –Intensity modulated radiotherapy is a highly conformal radiotherapy technique wherein the intensity of the beams is spatially modulated by using the differential movement of computer controlled MLC's i.e., Multi leaf collimators thereby producing a more homogenous dose distribution in the tumour.

IGRT – Image guided radiotherapy is a method which uses advanced imaging technology like x-ray or CT scan images to monitor the entire treatment process. This reduces set up errors, inter and intra-fraction tumor motion during treatment. Hence, treatment can be delivered even more accurately with minimal safety margins.

These highly conformal techniques (IMRT, IGRT etc) thereby minimize side effects of treatment.

### **Radiation Delivery Devices**

In our Hospital, we use state of the art Linear accelerators, advanced imaging techniques and high speed computer based systems to deliver radiation to the tumors with remarkable precision.

Omega hospitals is the only hospital in the twin states of Telangana and Andhra Pradesh which has **CYBERKNIFE** ROBOTIC Radio-surgical System

- It is the World's first and only ROBOTIC Radiosurgery system designed to treat tumors anywhere in the body
- The only system that can continuously track (by real time imaging), detect and correct the tumor and patient movement throughout the treatment
- Can deliver High doses of radiation in 1-5 fractions thereby reducing the overall treatment duration and minimizing the patient discomfort
- Delivers radiation with submillimeter geometric accuracy and a mechanical precision of <0.06mm
- Utilizes image guidance technology and computer controlled robotics to deliver radiation and hence it is a frameless non-invasive system

Our expert team of radiation oncologists and medical physicists work together to meticulously plan radiation dosage before your treatment and are also present during treatment to ensure that radiation is delivered correctly and in precise locations. Hence, we offer highest level of accuracy and safety during every step of your treatment.