Brain tumours

What are gliomas?

Gliomas are a collective term for various brain tumours of the central nervous system and refer to both benign and malignant growths in the brain.
Gliomas develop as a result of abnormal, uncontrollable cell growth, most commonly from the tissue that supports and nourishes the nerves, the glial cells (from the Greek, meaning “glue”). They usually occur in the brain, but are also possible in the region of the spinal cord and the cranial nerves.
The collective term, glioma, includes the following types of brain tumour, among others:

- Glioblastoma
- Astrocytoma
- Oligodendroglioma
- Oligodendrocytoma
- oligoastrocytoma

Glioblastomas
are the most commonly occurring malignant primary brain tumours in adults. The glioblastoma has histological similarities to the glial cells of the brain. The Treatment consists of surgical reduction of the tumour mas, radiation and chemotherapy.

Astrocytomas
are the most common tumours in the brain. They develop predominantly in middle age. They originate from the astrocytes, which are part of the supporting tissue (glial cells) of the central nervous system and this is why they are classed as gliomas.

Oligodendrogliomas
are a type of glioma that are belived to originate from the oligodendrocytes of the brain. They account for about 10 percent of all gliomas. They mainly affect adults between the ages of 35 and 50 years and are principally located in the frontal lobes of the cerebrum.

Oligodendrocytomas
also belong to the group of gliomas. They grow diffuse infiltrating. Under the microscope, their cells resemble the oligodendrocytes, a specific type of support cells that form myelin.

Oligoastrocytomas
are diffuse gliomas occurring in middle-aged adults, which have components of an oligodendroglioma and an astrocytoma.

Clinical symptoms may vary to a major extent depending on location, size and type of brain tumour. On the one hand they include non-specific signs, such as headache, dizziness, nausea and vomiting. On the other, specific symptoms may occur, such as paralysis, disturbance of the sense of touch, speech or vision problems, epileptic seizures and personality changes. In very rare cases, gliomas form secondary tumours in other organs, in other words, these tumours usually remain restricted to their site of origin.

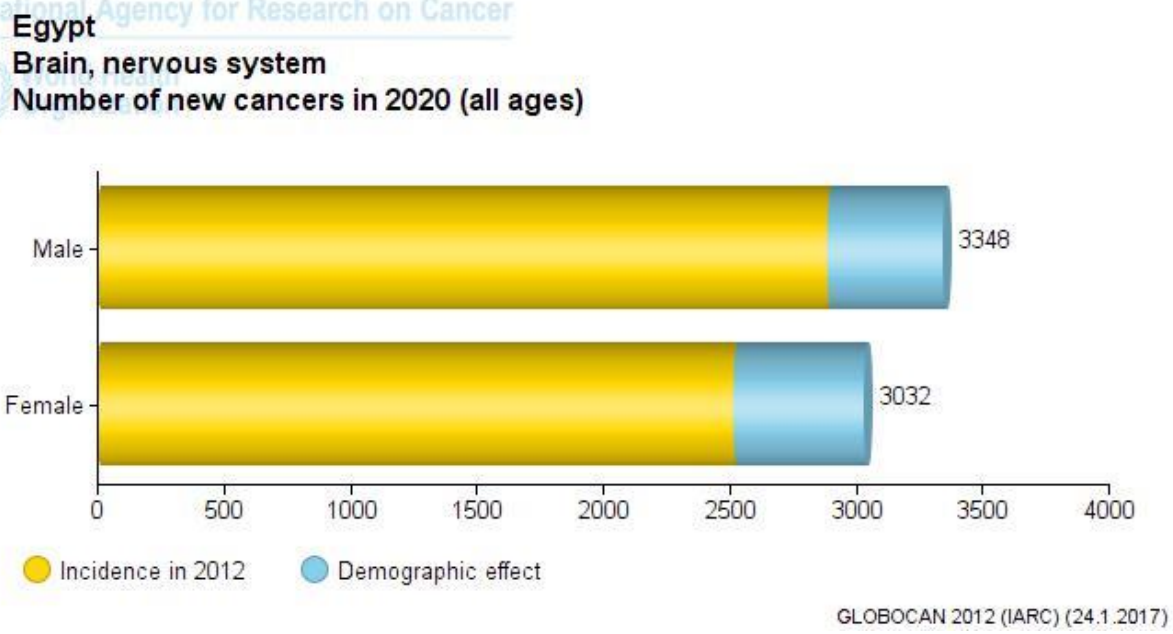
Brain tumours and gliomas are far less common than other cancers. Both adults and children may be affected. Patients can be helped by modern treatment methods. Gliomas account for half of all brain tumours .

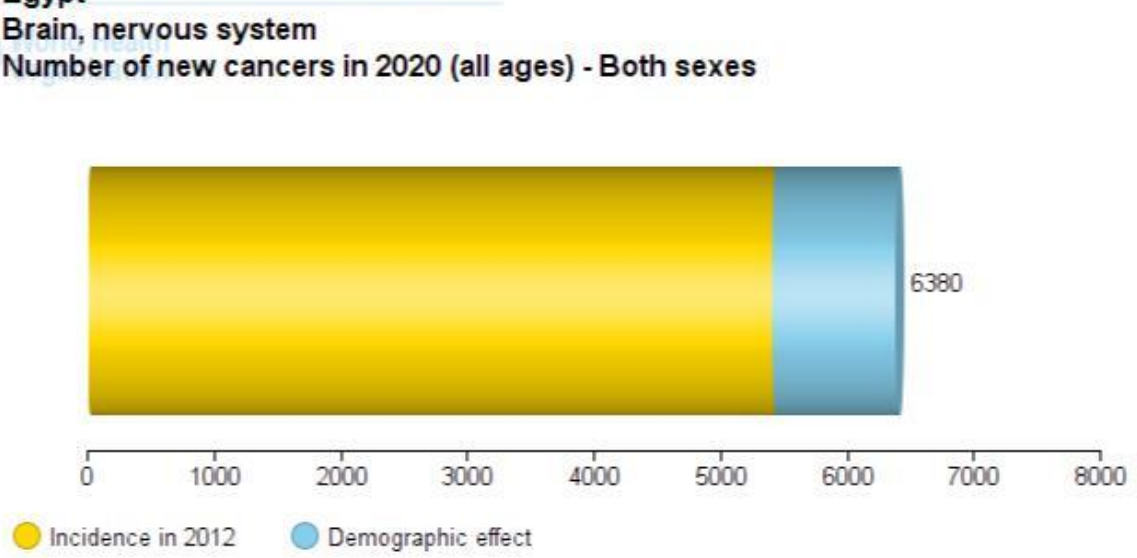
Egypt - Brain, nervous system cancer

Year	Estimated number of new cancers (all ages)	Male	Female	Both sexes
2012		2889	2515	5404
	ages < 65	1879	1380	3259
	ages >= 65	1010	1135	2145
2020		3348	3032	6380
	ages < 65	2095	1525	3620
	ages >= 65	1253	1507	2760
Demographic change		459	517	976
	ages < 65	216	145	361
	ages >= 65	243	372	615

GLOBOCAN 2012 (IARC) - 24.1.2017

Population forecasts were extracted from the *United Nations, World Population prospects, the 2012 revision*.
Numbers are computed using age-specific rates and corresponding populations for 10 age-groups.





What are the causes and risks for the development of gliomas?

The causes of the development of tumours of the nervous system continue to be largely unknown despite intensive research. These tumours develop in the majority of patients without any triggering factors being detectable. The suggestion that is repeatedly heard that brain tumours can be triggered by electromagnetic fields, from mobile phones or high-voltage cables, for example, has not been confirmed in severeal studies.

The answer to the question of whether gliomas can be inherited is negative for the majority of patients. Although hereditary tumours do exist in very rare cases, these cases involve known family genetic syndromes, such as Turcot's syndrome, for example, or Li-Fraumeni syndrome. In medicine, the term syndrome means the simultaneous existence of various signs of disease, known as symptoms. Their causal relationship is more or less known or can at least be assumed. The genesis and development of the disease is not known. The term syndrome is often used if symptoms of disease are involved that are, at least to some extent, uniform and similar in comparable cases.

What role does lifestyle play in gliomas?

Neurological disorders or functional impairment often result in a patient no longer being able to continue with his normal everyday life. Intensive rehabilitation with speech and occupational therapy may bring about positive results for the patient in terms of relearning physical functions, language and memory skills.

A healthy diet reduces the risk of developing cancer and protects against a relapse after surviving the disease. It provides important protective substances that have a positive effect on the progress of the disease and strengthens the body's own defences.

All experts agree that the ability to drive is temporarily compromised with gliomas. It is essential that patients consult their doctors before starting to drive, at least partly in order to avoid putting their insurance cover at risk in the event of an accident.

If the limitations are so great that the patient can no longer undertake his normal employment, he can apply for early retirement. However, many patients with brain tumours find that work helps them. It distracts them from their illness and provides them with the feeling of being needed.

How are gliomas in the brain diagnosed?

The doctor has several diagnostic methods available in the case of a suspected brain tumour, after taking a detailed history:

Neurological examination
The history (recording the history of the illness) together with a thorough physical examination can already provide the doctor with the first indications of a brain tumour.

Computer tomography
In this procedure, the brain is x-rayed and displayed in cross-sectional images. This allows tumours, calcification and bleeding to be detected.

Magnetic resonance imaging or nuclear magnetic tomography
Magnetic resonance imaging (MRI) or nuclear magnetic tomography is a radiological procedure with which cross-sectional images can be created with high contrast, excellent resolution and any direction of section desired. This radiation-free procedure is based on the magnetic characteristics of tissue, and particularly of tissue fluids. It is possible to distinguish between abnormal and healthy tissue on the basis of the hydrogen content, which is often different.

Irregularities in the brain are rendered visible in even greater detail than with computer tomography. This procedure is usually recommended if computer tomography has yielded a suspicious result or has not revealed anything abnormal despite a tumour being suspected.

Magnetic resonance imaging not only allows the body to be displayed in any sectional direction desired, but also offers a large number of contrasts. This means that it is possible to distinguish between different types of tissue and also to see pathological changes from normal tissue. In some cases an MR-contrast medium is given, which provides further amplification of the contrast.

Magnetic resonance spectroscopy (MRS)

can measure metabolic products and hence metabolic processes in the brain, such as sugar, neurotransmitters or their metabolic products, for example. The substance is determined by its very individual pattern, which is unique for every molecule, in a similar fashion to a fingerprint. Every “peak” in the spectrum measured can be allocated to a specific molecule.

PET (Positron emission tomography)
This procedure can be used to render metabolic processes in the body visible. For the examination, the patient is given some sugar that has been loaded with a radioactively labelled substance. The sugar is broken down in the body and leaves a trace as a result of the radioactive substance. The special recording technique used in PET makes this trace visible. Since malignant tumours have greater metabolic activity than healthy tissue, they stand out in the PET image.

SPECT (Single Photon Emission Computed Tomography)
Single Photon Emission Computed Tomography (SPECT) is an examination technique with which the metabolism of different organs can be graphically displayed. This is possible by using radioactive substances (tracers) injected into the patient before the examination. They are distributed through the body and accumulate in the organ to be examined. A special camera is then used to measure the radiation emitted from the tissue. The results of the measurements are compiled to form a three-dimensional image

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What are the treatment options for a glioma?

The important aspects in selecting the treatment of gliomas in the brain are the patient's condition and the location of the tumour.
Various treatment options are available:
1) Surgery
2) Radiation
3) Chemotherapy

1) Surgery
The most important treatment option and, at the same time, the first therapeutic step, is surgery. Only a few gliomas are inoperable as a result of their location in the brain.
The aim of surgical removal of the glioma is to reduce the mass of the tumour as much as possible. This may improve the patient's quality of life. Maximum removal of the brain tumour, known as complete resection, means that concomitant treatments, such as follow-up chemotherapy, can be more effective.
Doctors will decide on surgery if the tumour is easily accessible and removable in an operation using the techniques and instruments available, if the tumour is very large and if the overall condition of the patient allows surgery to be considered. This form of resection is performed with the patient awake in some cases, in order to make sure that as much of the tumour as possible can be safely removed. In this way, the surgeons can perform the best possible resection with the lowest possible risk.

Biopsy
A biopsy is a tissue sample. The tissue material obtained in this way is examined under a microscope for pathological changes. Information is also obtained about the type and characteristics of the tumour cells that are present.

Follow-up treatment
Most patients take cortisone for three to seven days after surgery. Dose reduction is undertaken gradually depending on the clinical and radiological findings.

Additional treatment, such as radiotherapy and chemotherapy is then given depending on the result of the histological examination (biopsy).

2) Radiotherapy

An operation alone is often not able to reliably remove the tumour without leaving behind microscopic residual tumour tissue. Brain tumours are frequently capable of growing into the surrounding brain tissue. These cell complexes cannot be seen with the naked eye either before or during the operation and cannot be detected using imaging procedures.

The aim of radiotherapy is to prevent residual cell complexes from growing any further or to eliminate visible tumour tissue. A specific dose of radiation is necessary to achieve this, the size of which will vary depending on the type and size of the tumour, the surrounding normal, healthy tissue and the condition of the individual patient being treated. Treatment may last for a fairly long period, extending over several weeks. The effect and treatment-related side effects are more or less restricted to the area of the body to which the radiation is administered.

In order to be able to implement the radiotherapy as gently as possible, it is given in fractionated form in almost all cases, in other words small portions of the overall dose are administered daily. This allows the tumour cells to be damaged while better protecting the surrounding normal and healthy tissue. The level of the individual and overall doses and the size of the area to be irradiated depend on the type and spread of the cancer.

3) Chemotherapy

Chemotherapeutic agents are drugs that are used with the aim of killing cancer cells or preventing them from growing any further.

Various chemotherapeutic agents (known as cytostatic drugs) are used either alone or in combination depending on the type of tumour.

The strategy that is always applied in chemotherapy is to achieve the maximum effect on the tumour and to protect the healthy tissue as much as possible.

A number of different drugs are available that stop cell division (cytostatic drugs). The products most commonly used in the treatment of gliomas are, for example, temozolomide, lomustine, bevacizumab/irinotecan, carmustine, procarbazine and vincristine. Products, such as carboplatin, cisplatin and methotrexate, are used only relatively rarely. At present, many new substances are being investigated in a large number of trials.

These products primarily develop their action in the cell nucleus, the control centre of the cell. Here they damage the genetic molecule, the DNA (deoxyribonucleic acid). This results in the cell dying or no longer being able to divide.

Medicinal products have the advantage that, in contrast to surgery and radiation, they allow a “systemic” treatment, i.e. one that affects the whole body. The cytostatic drugs, given as an infusion, injection or in tablet form, spread in the bloodstream into all the tissues and organs of the body and in this way can also reach and destroy “hidden” cancer cells. The brain is an exception to this rule: it can only be reached by certain cytostatic drugs.

Chemotherapy takes place over several cycles: the drugs are normally given over a period of between one and five days. This is followed by a break in which the healthy tissue and organs of the body, such as the bone marrow and mucous membranes of the digestive system, can recover from the cell-damaging effects of the cytostatic drugs.

Most cytostatic drugs are injected or infused via a “drip” (infusion). Some of the drugs can also be taken orally, which involves being swallowed in tablet form.

Additional Information

Gliomas in the brain – classification of tumour type and tumour stage

Primary tumours of the brain and spinal cord include a wide range of different types of tumour developing from different cells of the nervous system. In the case of a malignant metastatic tumour, the original tumour is described as the primary tumour.

Exact classification is the most important prerequisite for planning the optimum treatment.

The WHO classification (WHO = World Health Organisation) plays an important part not only in the assessment of an individual prognosis, but also as a guideline for further treatment. While WHO Grade I tumours can often be treated with surgery alone, WHO Grade II, III and IV tumours are treated with additional radiotherapy and/or chemotherapy after surgery.
The response to this additional treatment may vary widely from one tumour to the next. Some types of tumour often shrink very well and for a long time, while others will often respond to the treatment only for a short time and then reappear.