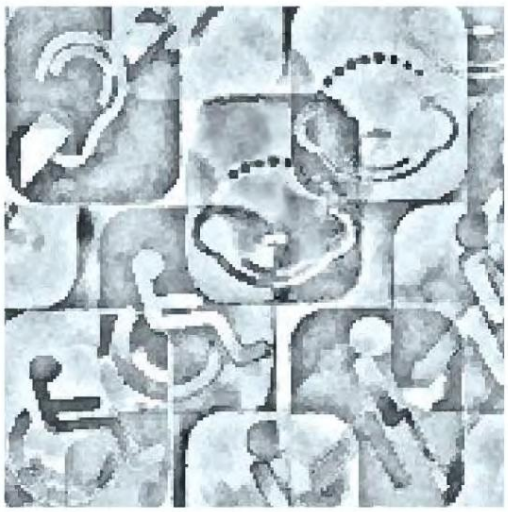

COMMUNITY

FROM MADRID

GUIDANCE GUIDE FOR ASSESSMENT OF DISABILITY IN PATIENTS WITH BRAIN TUMORS

FUNDACIÓN DACER DAÑO CEREBRAL

ASATE

Asociación de Afectados por Tumores Cerebrales en España

Association of Affected by Tumors Cerebral in Spain

Genesis Care

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PRESENTATION

The objective of this Guide is to provide useful and updated information on the consequences of brain tumors and all those medical, psychological and social aspects that can compromise the functional independence and participation in the community of the affected people.

The damage generated by a brain tumor is very varied and depends on its location, the type of cells involved and multiple other factors that make it impossible to determine its extent using a single general pattern. The consequences may be due to both the tumor itself and the treatments the patient has received or the medication they are using. Despite this, all people with a brain tumor and their families have in common that they have to adapt to an unforeseen event that will alter the normal development of their lives, from the moment of diagnosis.

Adequately evaluating how this impact is manifested is the responsibility of the Base Assessment and Guidance Centers for people with disabilities in the Community of Madrid, which depend on the Department of Social Policies and Family. The legal recognition of disability activates unique social protection in the exercise of people's rights. It provides access to different types of support mechanisms (specialized rehabilitation services, financial benefits, tax benefits, specific support for socio-labor insertion, etc.) and is, therefore, very important for families facing the repercussions of an illness. which often involves continued treatments and an extra personal, work and social cost that is added to the physical effects of the tumor.

This document is the result of the collaboration of the Community of Madrid with the Association of People Affected by Brain Tumors in Spain, to whom the Ministry of Social Policies and Family would like to thank its commitment to comprehensive care and improving the quality of life of patients. patients. The text sought to share the experiences of those affected and their families and the experience of Madrid's professional disability assessment teams, with the aim of identifying all the relevant aspects for the technical opinions issued from the Base Centers.

The Guide is part of a broader series of publications from the General Directorate of Care for People with Disabilities of the Ministry of Social Policies and Family that, always based on the national regulations that regulate the processes of recognition of the degree of disability, It has been proposed to give visibility to the specific needs of different groups. With this line of work, the Community of Madrid wants to promote quality and transparency in disability assessment procedures, guaranteeing equitable access to social protection measures and the right of all people to achieve maximum opportunities. vital.

Ministry of Social Policies and Family. Madrid's community.

Since its foundation in 2011, the Association of People Affected by Brain Tumors in Spain offers its help, attention, information and collaboration to the particular needs presented by patients with brain tumors, all different and different.

We inform patients and their families about reference centers, innovative treatments, clinical trials, psycho-oncological care, rehabilitation of brain damage, we organize information days on brain tumors and we try to help them with the aim of improving the patient's quality of life.

Therefore, it is a source of satisfaction to present this guide, rigorously prepared by specialists who must intervene in the different moments and approaches of the disease, which tries to offer an assessment in accordance with the complex sequelae that brain tumors produce in patients.

With it, we aim to improve the care offered to patients in the social and family sphere, but more specifically in the workplace once they have overcome the disease. We understand that thanks to progress in cancer treatments, the reintegration or job adaptation of those affected has become one of the great challenges that we will have to take on in the coming years and we at ASATE want to collaborate directly to achieve it.

Without forgetting that each patient constitutes a singularity with specific needs, attempts have been made to gradually offer different levels or degrees of limitation in the performance of daily and work activities. With an explanatory and empathetic desire towards the daily life of those affected, I trust that it can be taken as a reference from which we can build a social reality that integrates our differences and specificity of those affected by brain tumors in Spain.

Those of us affected by brain tumors can and want to contribute a lot to society and the world of work and thanks to this type of initiative, the involvement, application, dissemination and expansion by the competent organizations, we are sure of being able to achieve it, being the Community from Madrid, a pioneer in this type of initiatives.

I want to thank all the people who have collaborated to make this guide, the availability shown by the Department of Social and Family Policies of the Community of Madrid directing its content, the coordination carried out by the professionals of the Base Center No. 2 of the Community of Madrid, as well as the invaluable work carried out by the professionals who have participated in writing its content.

Association of People Affected by Brain Tumors in Spain.

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EPIDEMIOLOGY

Primary CNS tumors represent 2% of all cancers in adults and up to almost 15% in children under 15 years of age; which indicates that it is, at least in adults, a rare tumor, with a higher incidence in men and in white people compared to black people. In a 2007 study in the USA, an incidence of 6.36 per 100,000 people/year was calculated. In Spain, it is estimated that around 3,500 to 4,000 new cases are diagnosed each year. In adults, the most common are metastatic tumors. The location is more frequently supratentorial in adults (80%) and infratentorial in children (60%). In children it is the second cause of death

in children under 5 years of age.

IMPACT ON THE COMMUNITY OF MADRID FOR THE PURPOSES OF DISABILITY RECOGNITION

To analyze the impact, number of people, ages at which disability is recognized, the database of the General Directorate of Care for People with Disabilities of the Community of Madrid has been exploited. For the analysis of this task, the relevant disability and deficiency codes have been associated, which in accordance with Royal Decree 1971/1979 and other regulations approved by the Central Administration have been considered by consensus of the members of the corporation.

In view of the above, it has been confirmed that there are 463 people in the Community of Madrid recognized as having more than 33% disability, with the deficiencies found to be permanent consequences being the following:

Firstly, there are 106 recognized people affected by coordination and balance disorder.

Those affected by hemiplegia, both right and left, individually, reach 58 recognized people.

In third place would be those affected by generalized or non-generalized seizures. with more than 33%, as well as partial seizures (13 people).

Two people with neurovegetative dysfunction.

There are 263 recognized people with hearing problems.

With problems of aphasia, dysphonia, dysarthria and expressive disabilities, 113 recognized people have been found, which leads us to understand that in the case of the evaluation of brain tumors, all members of the evaluation teams must always intervene.

We also found it of interest to investigate by age groups the impact of the brain tumor and its consequences, understanding from the above, not when it is diagnosed or treated, but when it has permanent consequences that generate the right to social protection for disability, highlighting the following :

a) Only 45 people have been recognized before the age of 18, although there are express recognitions even in the 0-6 year old group

b) In the age groups of 18 to 65 years, practically the bulk of applications and recognitions are concentrated, reaching 78.4% of the total, the rest are over 65 years of age,

c) Cognitive disorders do not affect, or have not been recognized in minors 18 years.

Given the above, it seems evident that coordination with the oncological units of the national health service, and with its social work departments, must be encouraged so that the social protection provided for by current regulations is closer to the entire affected population. .

ETIOLOGY. RISK FACTOR'S

The risk factors are little known in the case of brain tumors.
Genetic and environmental factors, viruses, radiation and trauma have been considered as possibly involved in their development, but it is very likely that they are multiple mechanisms that act on genetic bases. Multiple factors are being studied that could increase the relative risk of suffering from a brain tumor, although there is no conclusive evidence other than the following:

Genetic factors:

It cannot be said that there is currently clear data to consider that some brain tumors may be hereditary. However, there are hereditary syndromes in which brain tumors are part of the overall syndrome, such as neurofibromatosis (multiple tumors in the skin and nervous system with different shapes and degrees), von Hippel-Lindau disease, tuberous sclerosis, Li-Fraumeni syndrome, Turcot syndrome and nevoid basal cell carcinoma syndrome. There are also chromosomal alterations in the same tumors that can be studied to better adjust treatment, as in the case of changes in chromosomes 1 and 19 in oligodendrogliomas.

Radiations:

Ionizing radiation is a risk factor in any tumor.
In particular, cranial radiotherapy for another tumor predisposes to the appearance of brain tumors, up to 20 or 30 years later. Regarding non-ionizing radiation and electromagnetic fields (such as those from mobile phones), it is not clear that they predispose to the appearance of this pathology, although at the moment the existing studies have presented controversial results and do not allow this possibility to be completely ruled out.

Chemical substances:

Within the chemical compounds we can highlight the nitrous compounds present in the environment. Some data suggest that exposure to vinyl chloride predisposes to glioma

Others:

Epstein-Barr virus infection was implicated in the etiology of primary CNS lymphoma. Transplant recipients and patients affected by acquired immunodeficiency syndrome are inherently more vulnerable to primary CNS lymphoma.

INITIAL SIGNS AND SYMPTOMS

The brain has little chance of expanding (growing) as it is surrounded by a rigid and closed bone structure called the skull. Therefore, when a tumor appears and grows, the symptoms generally appear quickly and abruptly. The symptoms will vary depending on the affected area(s) and the presence or absence of intracranial hypertension, so they can be very varied.

The initial symptoms of a brain tumor will depend mainly on the **location** of the same (See anatomy section).

In tumors of the **frontal lobes,** so-called motor alterations may appear, such as paralysis of the face or extremities, language disorders, cognitive function disorders (mood changes and lack of attention), behavioral and personality alterations, and incontinence (loss) urinary and/or intestinal.

In tumors of the **temporal lobes,** visual, auditory, balance, or smell and taste disorders may appear. Also language or memory disorders as well as emotional and behavioral alterations.

The **parietal lobes** do not have a good separation from the rest of the lobes, which causes more complex clinical manifestations. Various symptoms may occur, such as visual disorders or difficulty in recognizing

objects or parts of the body or language.

In tumors of the **occipital lobes,** visual disorders, including blindness, stand out above all.

Cognitive or behavioral symptoms:

Typically, nonspecific symptoms such as drowsiness, slowness, and apathy appear at first, but confusion, attention problems, mnesic (memory) alterations, and even unconsciousness and coma may also appear.
Also changes in personality, mood or emotions.

Headache:

It is the most frequent presenting symptom. It is classically more intense in the morning, can wake the patient at night, and worsens with coughing, sneezing, and positional changes. If HTIC exists, it may be associated with nausea and vomiting.

Seizures:

A seizure is a symptom that reflects abnormal activity in the brain.
It can appear as a consequence of a brain tumor (it is the first cause of epilepsy between 35 and 50 years of age), although there are also other causes. They may present previous symptoms (aura) that allow the patient to anticipate their appearance.
Headaches. They are very common in brain tumors, occurring throughout the clinical course in 70% of patients with primary parenchymal tumors and 40% with metastatic brain tumors, and may precede diagnosis by months or years. Oligodendrogliomas, temporal lobe neoplasms and metastases are especially epileptogenic.

There are **two types of seizures,** those called partial and generalized.
Partials may start in one part of the body and then spread to other areas and there may or may not be loss of consciousness during them. They can also cause uncontrolled movements. Generalized seizures can be of different types and are generally of greater intensity and severity with loss of consciousness and/or lack of sphincter control (bladder and/or anal). The type of seizure also depends on which part of the brain is affected.

The **treatment of seizures (both** preventive and when they occur) is mainly done with antiepileptic medications and serve both to treat them when they appear and to prevent them. Some of them periodically require

plasma level controls. Control of the tumor through surgery is also an essential treatment for seizures although it may be necessary to take medication regardless of whether the tumor has been removed by surgery.

Driving vehicles is usually prohibited in patients taking antiepileptics and particular situations such as bathing in the sea or pool must be supervised.

Visual symptoms:

Due to changes in the visual field, visual acuity, movements eyepieces.

Cerebrovascular complications:

The incidence, type and mechanism of cerebral vascular injury vary depending on the tumor. In general, hemorrhages and cerebral infarctions occur. They usually present with clinical hemorrhagic metastasis, glioblastoma multiforme, oligodendroglioma and medulloblastoma (children).

Symptoms of HTIC:

Headache, nausea, vomiting, loss of appetite. Typical of posterior fossa tumors (medulloblastoma in adults), tumors of the pineal region and craniopharyngiomas. They present with papilledema.

Paresis:

(Transitory or incomplete paralysis).

Hypoesthesia:

(Loss of sensitivity). Sometimes accompanied by paresthesias, dysesthesias or neuropathic pain.

Cerebellar involvement:

With ataxia, balance disorders, vertigo, dysdiadochokinesia and/or dysmetria.

Other symptoms:

Tremor, sphincter involvement, aphasia, dysphagia, apraxia, agnosia (the person can perceive objects but not associate them with the role they usually play), difficulties in reading, writing, hearing, taste or smell.

Location Specifics:

Craniopharyngioma: neuroendocrine dysfunction (obesity, short stature, diabetes insipidus), inferior quadrantanopsia.

Pituitary tumor They are: galactorrhea, amenorrhea, gynecomastia, enlarged hands and feet, facial changes, excessive body hair, obesity, low blood pressure, sensitivity to heat or cold.

DIAGNOSIS

In general, to diagnose a brain tumor we need a combination of several tests that will allow us to determine in the most precise way the diagnosis, degree of activity and extension of the tumor.

History and examination:

The first thing is a correct **history,** general physical examination and examination complete neurological

Image tests:

Imaging tests are also usually essential , both in diagnosis and in the extension study (number of lesions, size, affected areas), as well as assessment of secondary complications such as hemorrhage, radionecrosis, etc. The most frequently used are:

Computerized axial tomography **(CAT),** generally with iodinated contrast.

Nuclear magnetic resonance **(NMR),** sometimes also with gadolinium, which is the diagnostic test of first choice, currently having new techniques such as **spectroscopy** that provide valuable activity information.
tumor by measuring metabolites.

Positron Emission Tomography **(PET),** which allows visualization and quantification of multiple biochemical processes of tumor cells after the administration of a radiopharmaceutical.

SPECT (Single Photon Emission Tomography), where the information provided by a radiotracer (a drug normally administered intravenously) is analyzed.

Lumbar puncture (LP):

Cerebrospinal fluid (CSF) analysis is of particular interest in specific tumors, such as primary brain lymphoma or germ cell tumors. A LP can also be performed with the objective of introducing drugs and thus performing a
treatment of the nervous system.

Biopsy:

It is essential, basic and necessary to make the diagnosis. It is the only test that allows us to safely confirm the diagnosis, ruling out other causes of space-occupying lesions (such as infections) and typing the tumor.

Stereotaxic biopsy: A small incision is made in the skull through which, and guided by a stereotactic crown that is placed on the patient, the needle is introduced to accurately take a sample from a previously determined tumor location. in the imaging techniques performed.

Biopsy with open surgery: It is taken during the same act of surgery and sometimes the sample is analyzed during the same surgical act. On rare occasions, it is not possible to extract a sample of tumor tissue, either due to the location of the tumor or because the patient's condition does not allow it.

Electroencephalogram:

The electroencephalogram is a non-invasive test that allows studying the
brain electrical activity.

The electroencephalogram, encephalogram or EEG, is a test used to study the functioning of the **central nervous system,** specifically the activity of the **cortex of the brain.** It essentially consists of recording, using special electrodes, the electrical currents that are formed in the brain neurons and that are the basis of the functioning of the nervous system. Thanks to it, alterations in brain electrical activity can be diagnosed that suggest diseases such as **epilepsy,** narcolepsy , **dementias** or **tumors,** among many others. It is also an essential test to certify a death in a patient in a coma.

With this test you can identify normal and pathological rhythms of brain activity. Normal electrical waves depend on the state of wakefulness or sleep. The waves that are usually found are:

Wakefulness: alpha, delta, beta and theta rhythms.

Sleep: REM and non-REM activity (which is divided into **4 phases).**

Stimuli: alterations of the previous rhythms when visual, sound, painful or sensitive stimuli appear.

The doctor who analyzes this type of tests is the neurophysiologist or neurologist and with these initial data he will be able to make a fairly approximate analysis of the origin of the alterations. It is usually performed in specific neurophysiological units located in hospitals and clinics. The electroencephalogram (EEG) should always be accompanied by a good clinical interview and physical examination.

Reasons for taking the exam:

Neurons communicate with each other by producing small electrical signals, called impulses. An EEG is used to observe the electrical functioning of the brain, helps detect alterations in the entire brain or in some areas, and can be performed as a complementary study to other studies, especially radiological studies (CT, Magnetic Resonance). It can be used to diagnose or monitor the following
conditions:

Epilepsy.
Encephalopathy.
Inflammatory encephalopathy.
metabolic encephalopathy.
Toxic encephalopathy.
Connatal encephalopathy.
Hypoxic encephalopathy.
Eat.
Diagnosis of brain death.
Brain tumors and other space-occupying lesions.
Dementia.
Degenerative diseases of the central nervous system.
Cerebrovascular disease.
Craniocerebral trauma.
Headache.
Vertigo.
Psychiatric disorders.

In general terms:

The EEG is indicated in any paroxysmal phenomenon in which a cause of cerebral origin is suspected and in any situation of cerebral dysfunction, especially in the symptomatic phase.

CLASSIFICATION OF BRAIN TUMORS

The latest classification is from the WHO in 2007, which includes seven sections, which include multiple different varieties of tumors, which shows the great diagnostic complexity of this pathology. It is based on the histological type (type of cell from which it originates and which gives the tumor its name), and the degree of aggressiveness, which ranges from grade I (less aggressive tumors) to grade IV (tumors with very aggressive behavior). aggressive).

Histological Types (varieties of brain tumors):

Metastatic: Brain metastases outnumber primary neoplasms by at least 10 to 1 and occur in 20 to 40% of cancer patients. They are generally located at the cortico-subcortical level of the cerebral hemispheres (80%), or in the cerebellar hemispheres (15%). The primary tumors that most frequently metastasize to the brain are lung cancer (50%, especially small cells), breast cancer (15–20%), primary cancer of unknown origin (10–15%), melanoma (10%), colon cancer (5%) and kidney. 80% of brain metastases occur in the cerebral hemispheres, 15% occur in the cerebellum, and 5% occur in the brainstem. Brain metastases are multiple in more than 70% of cases. Cancers of the nasopharyngeal region involve the brain by direct extension along the cranial nerves or through the foramina at the base of the skull.

The cornerstones in the treatment of these tumors are corticosteroids, anticonvulsants and radiotherapy, as well as those of the underlying disease (which may include CT). Sometimes radiosurgery and surgical resection may also be useful.

Leptomeningeal carcinomatosis: LC occurs in 5% of cancer patients. The most common types are breast tumors (35%), lung tumors (24%), and hematological malignancies (16%). The symptoms usually include intracranial hypertension or paralysis of the cranial nerves, especially the oculomotor, facial and auditory nerves. Diagnosis includes a combination of neurospinal axis imaging and CSF cytology. The treatment of CL consists of intrathecal CT to which systemic CT or RT is sometimes added.

Gliomas: They are so called because they arise from cells called astrocytes. They are the most common primary tumors (around 38%).

Glioblastoma (GB). GB is the most common primary brain tumor in people over 20 years of age. Its maximum incidence is in the 5th or 6th decade of life, with a preference for men (60%). Preferred location in

cerebral hemispheres, originating from various locations in 5-10%.
They are tumors of rapid growth and marked malignancy, and with very particular characteristics such as the presence of cellular necrosis, great vascularization, and high infiltrative capacity that usually limits their surgical resectability. A small percentage (<10%) are the result of slow transformation from other low-grade brain tumors. They are usually large in size at the time of diagnosis, occupying more than one brain lobe or extending to the opposite hemisphere through the corpus callosum. Its symptoms are usually secondary to the increase in intracranial pressure, although being highly vascularized it may have a hemorrhagic ictal debut. The initial treatment for GB is surgery, but in 20 to 30% of cases it will only be possible to do a biopsy due to its location. Subsequent treatment most often combines the co-administration of CT and RT. TO

Sometimes local QT is added.

Astrocytomas:

Pilocytic Astrocytoma: it is grade II, which can generally be cured with surgery. They represent 5% of all gliomas and are more common in young people.

Anaplastic Astrocytoma : is a grade III tumor. It occurs more in men. They are tumors of an infiltrative nature, which makes it difficult for them to be completely resected. RT is usually applied after surgery, although various types of CT are being studied.

Oligodendrogliomas: They are rare tumors and the cells that make them up are called oligodendrocytes.

Oligoastrocytomas: They are very rare tumors that are generally composed of two different histological types (astrocytes and oligodendrocytes).

Meningioma. They are very common tumors (15% of intracranial tumors, and 27% of primary tumors), with a preference for women 2 to 1, with maximum incidence in the seventh decade of life. Most are benign (grade I), non-infiltrative and slow growing, often being encapsulated. They may be related to genetic alterations. If the tumor is in an area that can be intervened, surgery is the standard treatment. When complete resection is not possible, it has a tendency to recur, so post-surgical radiotherapy is indicated. Grade III meningioma has aggressive behavior and radiotherapy

is clearly indicated after surgery. The role of chemotherapy is little studied but may be necessary in cases of relapse.

Craniopharyngioma. It is a congenital, benign and rare tumor (3–5%), which appears in childhood and late adolescence. They usually occur near the pituitary gland, causing compression of the optic chiasm (with optic atrophy, hemianopsia), in addition to HTIC. It also produces pituitary alterations (libido disorder, amenorrhea) and hypothalamic alterations (drowsiness, abnormalities in the control of body temperature, diabetes insipidus). The treatment is surgical.

Pinealoma: These are tumors originating in the pineal gland. This, located in the middle of the brain, controls the sleep and wake cycle. Several histological types are distinguished: germinoma, pinealoma (pineocytoma, pineoblastoma), teratoma and glioma. The most common is germinoma, which usually appears in childhood and early adolescence with a slight predominance in males. The clinical picture consists of a syndrome of intracranial hypertension combined with typical signs such as paralysis of vertical upward gaze (Parinaud syndrome) and pupillary alterations. Treatment consists of surgical excision as wide as possible followed by radiotherapy. In general, it has a very good prognosis except in patients whose germinoma has components of choriocarcinoma and embryonal carcinoma in which it is recommended to combine treatment with chemotherapy.

Pituitary tumors. They are usually benign, but they secrete exaggerated amounts of pituitary hormones. The clinical picture consists of endocrinological abnormalities: amenorrhea, galactorrhea, Cushing's, acromegaly. Also due to location, headaches and visual field alterations are associated, especially bitemporal hemianopsia (decrease or loss of half of vision). Much rarer are the presence of cranial nerve involvement due to compression of the cavernous sinus or hypothalamic diffusion. Treatment depends on size. If it remains intrasellar or the extrasellar extension is limited, radiotherapy or transsphenoidal surgery is recommended; If the tumor is widely extrasellar, it should be approached by frontal craniotomy.

Schwanomas occur between the ages of 40 to 70 years, affecting women and men equally. They are usually benign.

Primary brain lymphoma: It represents 1-2 percent of all primary intracranial tumors but its incidence is increasing due to the association it has with states of acquired immunosuppression (AIDS, prolonged chemotherapy, transplants) or congenital (ataxia-telangiectasia, Wiskott-Aldrich). They are mostly B-cell lymphomas (tumors of lymphatic tissue) with intermediate or high grade of malignancy. They are located in any part of the brain, cerebellum and spinal cord and in 10 percent of cases they are found in more than one location. It's a

rapidly growing, highly cellular and infiltrative tumor with great capacity to invade the ventricular system and the subarachnoid space causing lymphomatous ventriculitis and meningitis. 30 percent of primary brain lymphomas disappear with steroid treatment, but later reappear. Surgery only has diagnostic value. Holocranial radiotherapy. The combined treatment of radiotherapy and chemotherapy has offered better results than radiotherapy alone in preliminary studies.

Ependymoma. They constitute 1–2% of all primary brain tumors and 5–6% of all gliomas. They are generally located near or within the ventricular system. Your treatment of choice is surgery with or without RT.

Subependymomas (grade I),

Myxopapillary ependymoma and ependymoma (grade II) and

Anaplastic ependymoma (grade III).

Medulloblastoma. It is a malignant tumor originating in embryonic cells, rare in adulthood. They are always located in the cerebellum and are very fast growing and have the capacity to spread to other parts of the CNS in addition to metastasizing outside the CNS to lymph nodes, bone and lung. Given their location, they can cause HTIC symptoms as well as cerebellar symptoms (instability, nystagmus). etc Treatment consists of the maximum possible removal of the tumor followed by radiotherapy especially to the neuraxis. Chemotherapy is recommended if the tumor has only been partially removed or there is a risk of its recurrence.

Germinals. They are also rare (1–3%) and occur mainly in young adults. They are subdivided into several types: **Germinoma, Teratoma, Embryonal Carcinoma, Endodermal Sinus and Choriocarcinoma.** A lumbar puncture is necessary given the possibility of CSF involvement. They can also be diagnosed by determining tumor markers in blood and CSF: Alpha-fetoprotein (AFP), Placental Alkaline Phosphatase (FAP) and Human Chorionic Gonadotropin (HCG). The treatment of choice for these tumors is chemotherapy or a combination of this with radiotherapy.

Hemangioblastoma of the cerebellum: This is a benign tumor that usually be located in the cerebellum causing a vermian or hemispheric syndrome with ataxia (inability to control voluntary muscle movements), nystagmus (unconscious and rapid movements of the eyeball), headache and inflammation of the optic nerve at its entrance to the eye (papilledema). Hemangioblastoma of the cerebellum is often accompanied by retinal angiomas (mole in the retina) and other alterations typical of Von Hippel-Lindau disease such as pancreatic cysts.

and tumors derived from renal tubular cells (hypernephroma). Complete removal of the tumor is curative.

Papilloma of the fourth ventricle: They are tumors of childhood, 50 percent appear during the first year and 75 percent in the first decade. The clinical picture consists of headache, drowsiness, vomiting, diplopia (double vision of objects, due to disorders in the coordination of the ocular muscles), alteration of gait and papilledema (inflammation of the optic nerve at its entrance into the eye).

Acoustic neuroma: The highest incidence occurs in the fifth and sixth decade, affecting both sexes equally. The clinic depends on the size. In the first stage, symptoms of hearing loss, vertigo and tinnitus appear. As it spreads, facial paresis, ataxia, hypoesthesia of the face, dysmetria, paralysis of the hypoglossus and vagus, and hydrocephalus appear. The treatment is surgical.

Tumors of the foramen magnum: They only represent 1 percent of intracranial tumors, but they are important because they can simulate other neurological diseases (multiple sclerosis, syringomyelia, amyotrophic lateral sclerosis, myelopathy due to cervicoarthrosis) and because, despite being benign and localized, extradural, if not diagnosed early cause irreversible neurological lesions. They are usually meningiomas or neurofibromas. The clinical picture is very variable. The most frequent symptoms are pain in the occipital region, radiating to the shoulder, and the presence of dysesthesia (sensitivity disorder with decreased and delayed sensations) in the upper extremities. As the tumor grows, muscle weakness (brachial, crural paresis, tetraparesis, paraparesis), gait disorder, sphincter incontinence and involvement of the lower cranial nerves (especially the spinal nerve) are added. The treatment is surgical.

WHO CNS Tumor Grades

	I	II	III	IV
Astrocytic tumors				
Subependymal giant cell astrocytoma	x			
Pilocytic astrocytoma	x			
Pilomyxoid astrocytoma		x		
Diffuse astrocytoma		x		
Pleomorphic xanthroastrocytoma		x		
Anaplastic astrocytoma			x	
Glioblastoma				x
Giant cell glioblastoma				x
Gliosarcoma				x

	Yo	II	III	IV
Oligodendroglial tumors				
Oligodendroglioma		x		
Anaplastic oligodendroglioma			x	
Oligoastrocytic tumors				
Oligoastrocytoma		x		
Anaplastic oligoastrocytoma			x	
Ependymal tumors				
Subependymoma	x			
Myxopapillary ependymoma	x			
Ependymoma		x		
Anaplastic ependymoma			x	
Choroid plexus tumors				
Choroid plexus papilloma	x			
Atypical choroid plexus papilloma		x		
Choroid plexus carcinoma			x	
Other neuroepithelial tumors				
Angiocentric glioma	x			
Chordoid glioma of the third ventricle		x		
Mixed neuronal and neuronal glial tumors				
Gangliocytoma	x			
Ganglioglioma	x			
Anaplastic ganglioma			x	
Infantile desmoplastic ganglioglioma and astrocytoma	x			
Dysembryoplastic neuroepithelial tumor	x			
Central neurocytoma		x		
Extraventricular neurocytoma		x		
Cerebellar liponeurocytoma		x		
Paraganglioma of the spinal cord	x			
Papillary glioneuronal tumor	x			
Rosette-forming glioneuronal tumor of the fourth ventricle	x			
Pineal tumors				
Pineocytoma	x			
Pineal parenchyma tumor of intermediate differentiation		XX		
Pineoblastoma				x
Papillary tumor of the pineal region		XX		
Embryonic tumors				
Medulloblastoma				x

	Yo	II	III	IV
CNS primitive neuroectodermal tumor (PNET)				x
Atypical teratoid/rhabdoid tumor				x
Tumors of the cranial and paraspinal nerves				
Schwannoma	x			
Neurofibroma	x			
Perineurioma	XXX			
Malignant peripheral nerve sheath tumor (PMVNP)		XX		x
Meningeal tumors				
Meningioma	x			
Atypical meningioma		x		
Anaplastic/malignant meningioma			x	
Hemangiopericytoma		x		
Anaplastic hemangiopericytoma			x	
Hemangioblastoma	x			
Tumors of the sellar region				
Craniopharyngioma	x			
Granule cell tumor of the neurohypophysis	x			
Pituitytoma	x			
Spindle cell oncocytoma of the adenohypophysis	x			

Source: *Louis, DN, Ohgaki H, Wiestler, OD, Cavenee, WK.* World Health Organization Classification of Tumors of the Nervous System. IARC, Lyon, 2007.

Prognostic factors

Among the prognostic factors to consider in brain tumors are the following:

Histological Type (type of brain tumor).

Histological grade: To define the grade, different characteristics of the cells are considered, such as nuclear atypia (alterations in the nucleus of the cell), mitosis (growth capacity), vascular microproliferation (appearance of new vessels) or necrosis (areas of the tumor with dead cells).

Genetic and molecular alterations: There are genetic biomarkers that, sometimes and increasingly in recent years, allow predicting the prognosis and individualize treatment.

Functional status: The patient's ability to lead a more or less independent life in terms of basic activities of daily living is an important prognostic factor. The more independent the patient is, the better.
will be its functional status and this leads to a better prognosis.

Age: In adults, the younger you are, in general, the more favorable the prognosis.

Residual tumor after surgery: If the tumor is unresectable, or there is some tumor mass left, the prognosis is worse.

Metastatic extension of the disease: The spread of tumors
brain to other organs or lymph nodes is very rare and exceptional except in a specific type such as medulloblastoma, which when it occurs carries a worse prognosis.

TREATMENT

The patient with a brain tumor must undergo specific therapy and treatment to relieve symptoms: headaches, seizures, loss of motor and sensory functions, etc. The specific treatment will consist of

surgery with or without radiotherapy, radiotherapy if surgery is not possible and chemotherapy may also be indicated, usually in association with other forms of
treatment.

Surgery

It is one of the main tools and generally the first to be used for the treatment of most brain tumors, and can be curative.
There is usually a correlation between the degree of resection and prognosis, so it is recommended to attempt a total or subtotal excision, limited only by the location of the tumor (preservation of neurological function), or by the patient's general health status. An exception to this recommendation is the case of deep-seated tumors, such as pontine gliomas, which are diagnosed based on clinical evidence and treated without initial surgery approximately 50% of the time. In tumor recurrences, surgery can be used in specific cases, although it is usually contraindicated by the patient's situation.

The main objectives of surgery are:

Obtain tumor tissue to be able to make a precise histological diagnosis, that is, to know what type of brain tumor we are dealing with.

Performing the maximum possible resection but preserving maximum function at the same time, which in many cases results in brain tumor surgery not allowing a complete resection of the tumor.

Decompress healthy tissues, which leads to a significant improvement in the symptoms that patients present, improving their functionality and quality.
of life.

Surgery is always highly complex but today it has new technologies that largely allow more complete resections with a lower risk of sequelae. Among the **different techniques** are:

Stereotaxy allows the tumor to be located using a geometric system that locates the most suitable point for the biopsy.

Neuronavigation systems, which are computer instruments that fuse radiological images during the intervention for a better definition of the extent of the tumor in the operating room.

Intraoperative cortical functional mapping. It is a system that allows you to locate eloquent areas and thus avoid damage to these areas during the intervention.

Fluorescence that allows the neurosurgeon to know better during the
intervention the area where the tumor is located.

Radiotherapy

It is another fundamental tool for the treatment of brain tumors, being essential in malignant tumors even with complete resection. In low-grade tumors it may be advisable to wait for a later progression before administering it.

Repeat radiation therapy (re-irradiation): Because there are no randomized trials, the role of repeat radiation after disease progression or the development of radiation-induced cancers is also poorly defined. The decision to use repeat radiation should be made carefully, due to the risk of neurocognitive deficits and radiation-induced necrosis.

An advantage of radiosurgery is the ability to deliver therapeutic doses to recurrences that may require reirradiation of previously irradiated brain tissue beyond tolerable dose limits.

Radiotherapy can be applied using **different techniques;** each of them can have different indications depending on the extent of the irradiation and the type
tumor.

Conventional external radiation therapy: Uses different external irradiation beams to irradiate the tumor volume and minimize the amount of surrounding healthy tissue irradiated, and thus, toxicity. The treatment is administered over several days or weeks, receiving equal daily doses. During the treatment the patient is immobilized with a mask to secure the irradiation points throughout the treatment.

Stereotaxic external radiotherapy: the irradiation volume is small and higher doses are achieved in a single session. The irradiation field is determined by a coordinate axis system placed on the patient, which allows the irradiation point to be precisely located. The use of specific machinery is required, such as a linear accelerator, or a gammaknife (a cobalt unit modified for multiplanar treatment) or a cyberknife (with a robotic system that allows the irradiation area to be better delimited). It may be useful in patients with brain metastases and in some cases of selected brain tumors.

Interstitial radiotherapy or brachytherapy: It consists of implanting catheters over the tumor area as irradiation sources (for example, iridium needles192, etc.) that achieve therapeutic doses around said area, avoiding irradiation of healthy tissue at a distance.

Particle beam therapy: Particles called protons or neutrons are used in very specialized centers, since a cyclotron is required to generate them. The main advantage of these techniques is the possibility of more precisely circumscribing the irradiation area. Although they have been used for some special types of tumors, their indications and advantages over conventional forms of treatment have yet to be defined.

Hyperfractionated external radiotherapy: It is a form of external radiotherapy in which, with a greater number of fractions and doses per day, the aim is to increase the destruction capacity of tumor tissue. It can be stereotaxic, if a small volume is to be irradiated, and may be useful in selected cases.

Intensity modulated radiotherapy: It is a system by which higher doses are given in some areas of the tumor and lower doses in other areas; The goal is to achieve adequate doses in all tumor tissues, with the least toxicity of the surrounding tissues. Based on recent studies, those locations where the results of conventional external radiotherapy can improve are becoming known.

Side effects:

Acute: They appear hours or days after the start of treatment and are transitory; They generally consist of headache or worsening neurological symptoms. These effects are produced by increased edema associated with the tumor and can be treated with steroids.

Early delayed toxicities: They can appear from six weeks to six months after completing radiotherapy. They are produced by reversible neurological damage and cause worsening of neurological symptoms, and are also treated with steroids. Clinically they may be similar to the changes that occur in the patient when the size of the tumor is increasing and in these cases, radiological studies and treatment may be necessary.
doctor.

Late toxicities: They can appear years after completing radiotherapy and are produced by destruction or cell death of brain tissue (radionecrosis); The symptoms are also similar to those produced by tumor growth, requiring, as in the previous case, a precise diagnosis and treatment.

Another undesirable late effect is **cognitive damage** that can range from slight neurological damage to full-blown dementia. Also, although very rare, **radioinduced tumors** or other toxicities such as loss of visual acuity or hormonal deficits may appear.

Chemotherapy

It includes conventional chemotherapy treatments and biological medications. There are two important difficulties: the existence of the blood-brain barrier (BBB) and the historical resistance of these tumors to antitumor treatment. In general, it is administered after surgery and associated or not with radiotherapy depending on the type of tumor or another. Sometimes it is also administered before surgery in order to reduce the size of the tumor or because surgery cannot be carried out. It is part of the standard treatment in high-grade gliomas and can be useful in relapses, relieving symptoms and, sometimes, increasing survival.

Local chemotherapy can also be administered in the surgical bed, and a survival benefit associated with radiotherapy after surgery has also been demonstrated.

Novel **biologic** therapies under clinical evaluation for brain tumor patients include: Dendritic cell vaccination, receptor tyrosine kinase inhibitors, farnesyl transferase inhibitors, gene therapy

virus-based, epidermal growth factor receptor inhibitors,
vascular endothelial growth factor inhibitors.

Side effects can be variable depending on the medications used. They can cause nausea, vomiting, fatigue, loss of appetite, leukopenia, anemia, thrombopenia, etc. In the case of biological therapies, the side effects are usually specific to them and vary with respect to those of chemotherapy.

Symptomatic treatments

Symptomatic treatments such as corticosteroids, antiepileptics, or analgesics can be used. Corticosteroids are useful in the immediate perioperative period and to relieve symptoms caused by cerebral edema. An attempt is made to reduce their use as much as possible, due to the side effects they produce. Antiepileptics are only used during the perisurgery period or if there have been previous epileptic seizures (secondary prevention). Patients with brain tumors are prone to the development of thrombotic events of multifactorial causes; For this reason, many of them need to be treated with low molecular weight heparins.

In addition, physiotherapy, occupational therapy, speech therapy and support may be required. psychological.

RELAPSES

Some types of brain tumors, especially those called gliomas, have a high tendency to reproduce once treatment is completed or even during it. Brain tumor relapse can occur months to years later depending on the type of tumor. The different options will be considered, which may sometimes be surgical again and/or radiotherapy and/or systemic depending on each case and each tumor.

Sometimes, and particularly in glioblastomas, an effect may occur that
We call **pseudoprogression** which, as its name indicates, is a false progression of the disease. This phenomenon occurs mainly in the first months following radiotherapy and can clinically and radiologically resemble disease progression without being so.

MEDICAL CONSIDERATIONS IN THE ASSESSMENT OF DISABILITY

The consequences of brain tumors can be due to both the tumor itself and the treatments the patient has received or the medication they are using. Not only is the subject's functional independence affected (with the subsequent need for care), but many times the need for continued treatment entails travel needs, costs, etc., which severely affect the family structure. Patients suffer a strong impact on their social participation, with the majority of those affected having to leave their job, and in many cases the main caregiver must also reduce or abandon their work time.

It must be remembered that sometimes the general impression that a patient offers at a motor level does not always correspond to the level of functionality, since in many cases motor abilities do not translate into ADL due to sensory, integration, coordination, cognitive, etc. problems. etc Even being able to perform an ADL, if it is carried out incorrectly, injuries, pain, etc. may appear, which may subsequently affect the subject's independence. Furthermore, it should be taken into account that the patient's motor and cognitive situation can be very variable, depending on temperature (affects muscle tone), fatigue, mood, distractions...

1. ENGINE LEVEL

to. Biomechanical alignment, joint range: Joint balance limitations, deformities, and dislocations or subluxations may appear. They are assessed by goniometry.

SCALE ASSESSMENT: Chapter 2, pages 35-50 (MMSS), p. 63-69 MMII.

b. Muscle tone: They may appear:

Hypotonia or hypertonia. It can even affect trunk control, with significant functional impairment at cardiorespiratory, swallowing, attention for...

Rigidity due to extrapyramidal involvement, typically in a cogwheel pattern. It can be measured using the UPDRS scale.

Spasticity is speed dependent and is usually associated with hyperreflexia.
Evaluation using Modified Ashworth Scale.

Dystonia or dynamic spasticity: unpredictable fluctuation from high pitch to low pitch, causing twisting and repetitive movements or abnormal postures. They are involuntary and sometimes painful movements, they can affect a single muscle or groups such as the arms, legs.
or the neck.

SCALE ASSESSMENT: Due to impairment of gait and ADL chap. 3, tables 3, 4, and 5, pages 108-109.

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c. Loss of strength: In any part of the body. To be valued by balance sheet muscular (Daniels).

SCALE VALUATION:

MMII: By affected areas: chapter. 2, table 47, p. 75, or due to impaired gait: chap. 3 table 3, p. 108.

MMSS: By zones chapter. 2, tables 22-25, pages 52-56. Or due to ADL impairment, chapter 3, tables 4 and 5, pages 108-109.

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d. Cerebellar involvement: It can cause different problems:

Balance impairment: with increased risk of falls, difficulties in walking. Sometimes accompanied by vertigo. It can affect the control of the
trunk.

Ataxia: Loss of motor coordination of movements

volunteers, due to cerebellar involvement. It can affect the extremities, trunk, speech, eye movements...Typically causes difficulty in transitioning to standing, altered gait pattern, use of total patterns, decreased central stability, and increased base of lift.

Dysmetria: Alteration in the coordination of voluntary movements.

The movements are executed without measurement in time or space, making them abrupt, with excessive amplitude, very fast or slow, and with difficulties in calculating distances. It is assessed by index-nose and heel-knee tests.

SCALE VALUATION:

For ataxia or loss of balance: chapter 3, table 3, p. 108 or also chap. 13, p. 235.

Vertigo is assessed by chapter 13, p. 235.

Dysmetria or tremor chapter 3, tables 4 and 5, pages 108-109.

and. Synkinesis: involuntary and unconscious movements that occur when other conscious voluntary movements are performed. Thus, the most affected member imitates the movements of the least affected member, or all the muscles of the most affected member contract when trying to perform a movement.

SCALE ASSESSMENT: Due to impairment of gait and ADL chap. 3, tables 3, 4, and 5, pages 108-109.

2. SENSORY IMPACT

to. Exteroceptive or superficial **sensitivity .** They may appear:

Hypoesthesia or anesthesia: decrease or loss of sensitivity to touch, cold or temperature.

Hyperesthesia: magnified sensations.

Paresthesias: abnormal non-painful sensations such as tingling, itching...

Dysesthesias: annoying abnormal sensations such as cramps, stings, burning...

b. Proprioceptive sensitivity: is the awareness of position and movement of the body, joints, speed and force of movement. When it is affected, motor clumsiness may appear, difficulties in bimanual or dexterity activities, and poor postural control even when sitting. At the postural level it can be assessed using the Romberg test.

c. Vibratory sensitivity: it is explored using a low-frequency tuning fork (128 Hz), making it vibrate first, starting in the most distal joints and progressively ascending to the most proximal ones.

d. Secondary sensitivity: Stereognosia: recognition of objects by touch with eyes closed. It is only evaluable in the absence of primary sensitivity alterations.

and. Neuropathic pain, which can also appear as allodynia (pain due to non-nociceptive stimuli such as rubbing of clothing), or hyperalgesia (pain greater than that corresponding to the stimulus).

SCALE VALUATION:

MMSS by zones chap. 2, tables 21, 23 and 25 on pages 52-56, or due to ADL involvement, chapter 3, tables 4 and 5, pages 108-9.
MMII by zones chap. 2, table 47, p. 75, or due to gait impairment, chapter 3, table 3, page 108.

3. GAIT ALTERATION

As a result of the impairment at the motor level (strength, coordination, balance), and sensory level (especially proprioception), an alteration of the gait pattern may appear. It can be evaluated using the *TINETTI Gait and Balance Scale.* The most typical are:

Hemiplegic gait: Due to muscle weakness, especially in ankle and foot extensors, in the swing phase, there is an inclination of the trunk towards the unaffected side, hip adduction and elevation of the hemipelvis, which causes a walking in a scythe, the leg describes a semicircle movement when taking the step.

In the support phase, the affected lower limb does not carry out a correct weight transfer, it is usually accompanied by a block in hip extension, knee hyperextension, and the foot rests on the external edge.

The affected arm may present an associated reaction (shoulder adduction and internal rotation, elbow semiflexion, forearm pronation, wrist flexion, finger flexion and thumb adduction).

Sometimes steppe may appear, consisting of hip and knee flexion in the swing phase, to avoid tripping over the affected foot.

Ataxic gait: Due to impairment of movement coordination, an unstable gait appears, with a wide base of support and wobbly. The movements are abrupt and exaggerated, so the lower limb is raised with more force than necessary and the foot falls hitting the ground with the entire sole.

Cerebellar gait: Due to balance impairment, the gait is unsteady with a wide base of support.

SCALE ASSESSMENT: chapter 3, table 3, page 108.

4. VESTIBULAR SYSTEM

It is related to balance and spatial control. Dizziness, vertigo, nausea, balance problems, or increased sensitivity to noise and strong lights may appear.

SCALE VALUATION:
Balance problems, chapter 3, table 3, p. 108 or also chap. 13, p. 235.
Vertigo chapter 13, p. 235.

5. RESPIRATORY SYSTEM

It is common to find alterations in the respiratory system of patients, for various reasons: weakness of the respiratory muscles, decreased elasticity or compliance of the lungs, postural problems, restrictive pathology, immobility, poor management of secretions...

Thus, fatigue, drowsiness, lack of phono-respiratory coordination, changes in skin color, increase and poor management of secretions, ineffective cough may appear... The clinical assessment will be through spirometry, gasometry and peak-flow.

SCALE ASSESSMENT: Chapter 4, pages 116-123.

6. LEVEL OF LANGUAGE, COMMUNICATION AND SWALLOWING IN TUMORS BRAIN

Depending on the area of the Central Nervous System where the tumor is located, the consequences on language, communication and swallowing functions can be diverse. We can find: language alterations (oral, written, gestural); alterations of voice, speech, and oro-facial and swallowing functions.

to. Language disorders.

Aphasia: Aphasia is the loss of the ability to produce or understand language, due to lesions in brain areas specialized in these tasks. Depending on the language area affected, different deficits will be shown and classified into subtypes: Broca's aphasia, Wernicke's aphasia, conduction aphasia, global aphasia, anomic aphasia, etc. Neologisms (invented words without any meaning) and simplified grammar may appear.

Apraxia of speech: disorder in the execution of learned speech movements that cannot be explained by weakness, incoordination or sensory loss or by incomprehension or inattention to the command. Difficulty appears in imitating speech sounds, in imitating movements not necessarily related to speech, and slowness in

He speaks.

Anarthria: Motor language disorder, characterized by a total loss of the ability to articulate language resulting from a brain injury. The ability to voluntarily mobilize the speaking organs is lost: jaws, lips, tongue, diaphragm, intercostal muscles, larynx.

Dysarthria: A set of motor speech disorders, of neurological origin, that cause difficulty in vocalizing.

Other language alterations: alterations in rhythm, speed, volume, phono-respiratory coordination, intonation.

SCALE VALUATION:

Aphasia: chapter 14, table 2, p. 254.

Dysarthria: chap. 14, p. 257.

b. Reading-writing disorders.

Alexia: Partial or total loss of previously acquired reading ability resulting from a brain injury.

Agraphia: Loss or alteration of the ability to produce written language, due to an acquired brain injury.

c. Voice disorders.

Dysphonia: It is the alteration of the voice in any of its qualities: duration, intensity, timbre and tone, due to organic disturbances or a lack of coordination of the respiratory, laryngeal muscles or the resonance cavities that intervene in the vocal act.

Aphonia: Total loss of voice.

SCALE VALUATION: Chap. 14, table 4, p. 256.

d. Swallowing disorders.

Dysphagia: Swallowing disorder characterized by difficulty in preparing the bolus and/or in moving it from the oral cavity to the stomach, with risks of choking and malnutrition. It typically causes discomfort or pain when swallowing, increased eating time, drooling, regurgitation through the mouth or nose, sensation of a foreign body in the throat, coughing, throat clearing, choking, changes in voice, and sometimes repeated respiratory infections.

SCALE VALUATION:

Dysphagia: chap. 13, p. 236.

Gastrostomy, jejunostomy: chapter 7, page. 174.

7. SPHINCTERIAL IMPAIRMENT

Urinary or fecal incontinence may appear both during treatment and permanently, with the consequent impact on self-esteem and the **social sphere.**

Neurogenic bladder appears in around 24% of patients. The most common is bladder hyperactivity due to impairment of cerebral bladder control, with consequent urgency and incontinence. Even reflex urination may appear. In some cases, difficulty may also appear at the beginning of urination, with the consequent difficulty in achieving complete bladder emptying. On the other hand, no alterations in detrusor synergism have been described.

sphincter.

Rectal dysfunctions: fecal incontinence may appear, both due to poor sphincter motor control and alterations in sensitivity to rectal filling, with

overflow losses. Sometimes and generally in relation to medication, constipation may appear, which in turn favors the appearance of incontinence.

SCALE ASSESSMENT: Urinary incontinence chap. 8, p. 185.
Fecal incontinence: chap. 7, p. 174.

8. IMPACT OF THE SEXUAL SPHERE

Affectation of the sexual sphere is common in these patients both due to the treatments that are instituted, as well as due to neurological sequelae or psychological affectation. Decreased libido is common in both sexes. Men may experience erectile dysfunction and problems with ejaculation. Women may have decreased lubrication, dyspareunia (pain during intercourse), vulvodynia, difficulties reaching orgasm, or chronic pelvic pain. Sometimes hypersexuality or sexual disinhibition occurs, generally associated with cognitive impairment.

It is also important to note the impact on fertility that occurs quite frequently, and often in very young patients, for whom not being able to have children can become a trauma that is impossible to overcome.

BAREMO VALUATION: Does not exist.

9. OTHER SYMPTOMS

to. General symptoms: It is common for cancer patients to present discomfort, anorexia, asthenia, fatigue, nausea... It is typical for these symptoms to appear during treatments or associated with intracranial hypertension, but sometimes they persist over time and although they are difficult to measure Objectively, they can be very disabling.

SCALE ASSESSMENT: If these symptoms are the most disabling, and since there is no specific section where they can be assessed, the complete scale can be made according to ADL impairment, chapter 1, page. 25.

b. Epileptic seizures: They are a typical initial symptom. They can remain even after treatment and in many cases medication is required, with subsequent side effects.

SCALE ASSESSMENT: If clinical control is not achieved by treating the tumor or with treatment pharmacological, they will be scaled according to chapter 3, table 1, page 104.

c. Headaches: They are one of the cardinal symptoms of appearance. They are sometimes associated with intracranial hypertension and can worsen with changes in temperature, forcing patients to take extreme precautions with sun exposure or low temperatures. They can be difficult to control pharmacologically and be maintained over time.

SCALE ASSESSMENT: Headaches themselves (like most pain) are not currently reflected in the scale. When they are important in intensity and frequency, and there is some way to objectify them (taking medication, visits to the emergency room, evaluation by a neurologist...), they could be classified as episodic neurological disorders (epilepsy), in chapter 3, table 1 , page 104.

d. Visual symptoms: Depending on which part of the visual pathway the damage occurs (the most common is the optic nerve), alterations in acuity, visual field, or ocular motility (which can cause diplopia) may appear.

SCALE ASSESSMENT: Chapter 12, pages 215 to 223.

and. Aesthetic affectation: As a result of surgery or chemotherapy, radiotherapy or medication treatments, which may affect patients psychologically and socially.

BAREMO VALUATION: They are not contemplated.

10. PSYCHOLOGICAL CONSIDERATIONS OF PATIENTS WITH TUMORS BRAIN

SCALE VALUATION: CHAPTER 16.

Within this sphere, two types of these alterations are differentiated that can affect the quality of life of patients with brain tumors and determine the adaptation to the different areas of their life.

Psychopathological alterations (organic damage and/or secondary to the oncological process).

Cognitive impairment

10.1 PSYCHOPATHOLOGICAL ALTERATIONS

CNS tumors represent an additional risk factor in the development of clinical psychopathological manifestations, mainly clinical depression, panic attacks or other anxiety disorders, as well as organic or delusional mental disorders (Andrewes et al., 2003; Wellisch et al. al., 2002). The prevalence of these alterations is between 41 and 78% from the first moments of the disease and can reach 90% for depressive symptoms in the event of progression.

of the illness.

Among all of them, Clinical Depression is the most frequent disorder and an appropriate differential diagnosis must be made with apathy as a clinical manifestation of the tumor itself, a fact that is not possible if only the diagnostic criteria provided by the APA (2013) are considered. In this sense, depressive symptoms can include sadness, hopelessness, feelings of worthlessness and guilt, loss of self-esteem and problems concentrating (Litofsky and Resnick, 2009; Pangilian, Kelly and Pangilian 2007). On the contrary, apathy caused by direct damage to medial frontal structures is characterized by difficulty feeling an emotion and experiencing interest, without evidence of emotional suffering (Valentine, Passik and Massie, 2002; Wellisch et al., 2002).

to. Psychopathological alterations associated with organic damage

Psychopathological alterations as a manifestation of the oncological disease are usually accompanied by neurological symptoms, an aspect that guides the diagnosis, although they may be the first and only manifestation of the tumor for a time. One fact to consider in this sense is that tumors that persist for a long time with only psychopathological symptoms are usually benign.

Psychopathological disorders associated with organic damage in patients with Brain tumors are divided between:

Alterations with general symptoms, independent of tumor location.

Alterations with focal symptoms associated with damage to brain areas specific.

Regarding general alterations, mood disorders are the most frequent and contrary to localization theories, this type of symptoms is associated with damage to different cortical structures, not being exclusive to frontal areas or the limbic system. In these alterations, apathy will be one of the determining symptoms of the disorder, accompanied by the absence of interest in activities in their environment. **Organic syndromes** (dementia, disorders of altered consciousness and bradypsychia), **personality alterations** and the presence of **psychotic symptoms** are also classified as psychopathological alterations associated with organic damage without being associated with a specific brain area, which can appear from the first moments, as a clinical manifestation of the tumor, or throughout the disease if a progression or recurrence of the disease occurs.

In this sense, a series of etiological factors related to the tumor have been differentiated that can explain its appearance and the quantitative parameters of these general psychopathological symptoms.

Location of the tumor: This variable does not completely define the appearance of psychopathological symptoms or the type of symptomatology.
It is currently stated that tumors at the cortical level are associated with a higher percentage of psychopathological manifestations, compared to those at the subcortical level.

Intracranial pressure: More than this variable, the appearance of certain symptoms is due to the consequences of said pressure: compression of certain brain areas and/or displacement of certain structures. At an emotional level it is associated with lability

emotional with disinhibition behaviors or increased irritability, loss of initiative that translates into apathy. In addition, cognitive deterioration occurs in different functions that will develop further.
forward.

Speed of tumor growth: Rapidly growing tumors more frequently produce agitation and confusional syndromes; while those that develop slowly are more associated with depressive episodes and personality alterations.

Regarding the alterations associated with damage to specific brain areas, the most frequent in brain tumors tend to be those related to the **frontal lobe,** with the involvement of three fundamental prefrontal circuits summarized in **Table** 1.

Table 1. Psychopathological alterations of prefrontal circuits.

prefrontal circuit	Main feature	Symptoms or associated alterations
Orbital syndrome frontal Disconnection of the surveillance system front of the system limbic.	Change in personality; They generally show irritability behaviors, impulse control problems or manic behaviors, emotional lability, distractibility, and difficulties responding to social cues.	- Disinhibition, which in addition to the main characteristic includes the inability to inhibit incorrect, repetitive responses. - Environment dependency syndrome environment: with a tendency to imitate the examiner or touch and use all the objects within their reach. - Peculiar sense of humor ("moria"), It refers to the patient seeming to have fun with what no one finds funny and the inability to "get" the meaning of a joke. -Basal lesion, they appear euphoric, sometimes even maniacs. This fact is more frequent with right lesions, which can lead to obsessive-compulsive disorder
Prefrontal syndrome-dorsolateral	Affectation of executive processes; refers to the failure in the ability to generate hypotheses, plan actions and make decisions to achieve an objective; deficit in focusing attention, analyzing the results and changing the strategy if necessary and difficulty in managing interference or entertaining oneself with stimuli irrelevant.	- Problem solving and decision making decisions: failures in deliberation times and in the quality of strategies used. - Other cognitive alterations: a) motor programming (temporal ordering of events); b) working memory; c) verbal fluency (difficulty in generalizing words). - At an emotional level it is accompanied by: apathy, lack of motivation, difficulty maintaining attention and high distraction, dependence on the environment and lack of curiosity.
Mesial-syndrome frontal	The most characteristic alterations are apathy and apathy, which in these cases refers to a state of absence of motivation and initiative, which can be complete.	- Akinetic mutism may appear especially in bilateral lesions. The patient is awake and does not show any emotion (Devinsky, 1995). - It only responds to its own reasons (it does not answer questions or present motor responses). He can talk and move perfectly if he wants to.

Source: self made.

On the other hand, **the temporal lobe** shares with the previous syndromes certain behavioral alterations and changes in personality, characterized by an exacerbation of premorbid characteristics. In addition, episodes of *déjá vu,* delusional symptoms and episodes of complex hallucinations of all types of sensory experiences (visual, auditory, gustatory, olfactory) may appear . It is important to note that these hallucinatory episodes occur without being associated with other psychopathological symptoms and the patient identifies them as external phenomena without alterations in the content or form of thought.

b. Emotional alterations secondary to the oncological process

Symptoms of anxiety and depression are one of the most frequent manifestations in cancer patients, being present in up to 85% of cases that present psychopathology (Nordin et al., 2001). In patients with brain tumors, the prevalence data for these manifestations fluctuate significantly from one research to another, reaching 90% for depression and 60% for anxiety (Liu et al., 2009).

There are a series of characteristics that can explain the greater prevalence of clinical reactive symptoms of anxiety and depression in patients with brain tumors, compared to other oncological pathologies and other chronic diseases:

Deficits or sequelae at a cognitive and/or neurological level.

Loss of autonomy or independence.

Fear of the appearance of epileptic seizures.

Limited life expectancy in some tumors.

Difficulty in social relationships and independence.

Furthermore, the treatments these patients receive must be considered to understand the clinical symptoms of anxiety and depression. In this sense, continuous corticotherapy treatment, used to reduce cerebral edema in patients with brain tumors, entails an increased risk of symptoms of depression and certain anxiety responses, such as psychomotor agitation and cognitive activation.

c. Alterations in sleep rhythm or pattern.

Difficulties in starting and maintaining sleep in these patients are other of the most frequent alterations in patients with brain tumors, as in other oncological populations, with a prevalence of around 52% of patients. They can appear both in the initial moments and years after the

disease, resulting in insomnia, hypersomnia, or parasomnias. However, some authors consider these difficulties as another symptom of mood disorders, so their interpretation in this field must be carried out with caution (Wellisch et al., 2002). Also in some cases they may be related to pharmacological treatment (drowsiness due to antiepileptic drugs, insomnia due to corticosteroids...).

SCALE ASSESSMENT: Hypersomnia proven by polysomnography, which does not respond to treatment for more than 6 months, is assessed according to chapter 3, table 1, page 104.

10.2 COGNITIVE IMPAIRMENT

This type of alteration is one of the most determinants of the quality of life of patients with brain tumors and their functional adaptation to the different areas of their daily life. Prevalence data for cognitive alterations vary widely from one study to another (12%-90%), depending mainly on the type of pathology analyzed and the time of the disease in which it is assessed.

The cognitive manifestations of brain tumors, like the rest of the neurological symptoms, vary depending on the location of the lesion, their biological characteristics and the pathophysiological mechanisms. However, some authors point out that two types of symptoms can be differentiated (Menéndez, Arribas and Chust; 2009):

1. General neurological manifestations.

2. Deficit or focal symptoms of subacute evolution.

At a cognitive level, among the **general neurological manifestations,** it is worth highlighting a pattern of decreased speed of information processing, with failures in understanding it, alterations in perception, drowsiness with loss of concentration, emotional lability with disinhibition behaviors. or increased irritability, apathy and ultimately, alterations in different memory processes. These alterations are attributed to an increase in intracranial pressure produced by the tumor mass itself, by edema or by obstruction to CSF flow, which is why once the associated causes are determined, an improvement in cognitive alterations is expected.

Regarding **focal symptoms,** these are produced by the compression that the tumor mass and perilesional edema exert on the neurons and white matter; They tend to be progressive in nature and have a subacute evolution (Menéndez, Arribas and

Chust, 2009). This type of alteration can be very variable from one patient to another according to the location of the lesion, which makes it impossible to develop in this document all the possible alterations at the cognitive level.

However, in literature (Douw et al., 2009; Heimans and Reijneveld, 2012; Henrikkson, 2011; Klein et al., 2002; Sanz, Olivares and Barcia, 2011; Soccianti et al., 2012; Taphoorn and Klein, 2004) and in clinical practice there seems to be agreement regarding the cognitive functions and domains with the greatest impact, regardless of the oncological treatments applied or the moment of the disease in which the evaluation is carried out. Among them it is worth mentioning:

Attention: selective attention (ability to select relevant information from several possibilities) and alternating attention (ability to change the focus of attention between tasks that involve different cognitive requirements).

Information processing speed mechanisms that determine the amount of information that can be processed in a unit of time.

Memory, being affected by a brain tumor can produce failures in any memory process, that is, in the fixation, storage or retrieval of information, mainly of verbal content.

Language: verbal fluency and verbal naming. The presence of alterations in this function is very dependent on the location of the
tumor in the dominant hemisphere.

Executive functions: among all the processes included, the most affected refer to the failure in the ability to generate hypotheses, focus attention, analyze the results and change the strategy if necessary; as well as alterations in working memory.

Visuospatial skills, which involves the ability to understand visual information, as well as generate and transform it into structured visual images. Its deficit produces failures in the discrimination and identification of visual figures that can be presented in a schematized way.

Lastly, it is considered important to point out the existence of a series of **factors,** in addition to the tumor itself, **related to the cognitive deterioration** of these patients that can influence its appearance and evolution:

Age. Older patients have a greater risk of cognitive deficits when diagnosed with a brain tumor.

Education. A higher educational level is associated with better neuropsychological performance, possibly associated with the neuronal reserve effect.

Type and degree of brain malignancy. Disease progression is defined as the variable that is associated with greater cognitive deterioration (Bosma et al., 2007; Giovagnoli et al., 2005; Wefel et al., 2011).

Oncological treatments.

Surgery can cause temporary cognitive damage and some of its complications can be associated with permanent cognitive deficits.

Radiotherapy has been the most studied, observing that immediate-delayed attention deficits and short-term memory deficits may appear temporarily. On the contrary, the delayed effects of this technique can cause insidious and progressive deterioration in attention and memory, along with neurological signs such as dementia.

Chemotherapy. There is little information regarding the side effects of this technique on cognitive performance. However, currently the effect on cognitive performance of certain chemotherapeutic agents, common to other systemic neoplasms, known as *Chemobrain, has been identified.*

ANNEX: COMMONLY USED SCALES

1. ADL:

to. FIM + FAM for basics, take into account not only if they carry out the activity but how.

b. Lawton and Brody for instrumentals, take into account not only if they carry out the activity but how.

2. MOTOR:

c. Daniels scale scored for muscle balance. d. Modified Ashworth scale for spasticity. and. Tinetti scale for gait and balance. F. Timed up and go for gait and balance. g. Berg for balance. h. Tandem walking for balance. Yo. 10 meter walk test for marching. j. Function in Sitting Test (FIST) for trunk control.

3. FATIGUE:

k. Fatigue Intensity Scale. l. Modified Fatigue Impact Scale (MFIS).

4. COORDINATION:

m. Heel-knee.

n. Finger-nose.

5. SPHINCTERS + SEXUALITY:

either. Three-day voiding diary.

p. ICIQ-SF urinary incontinence questionnaire. q. King's Health Questionnaire. r. Fecal incontinence severity index. s. Fecal incontinence quality of life instrument. t. IIEF International Index of Erectile Function.

PROPOSAL FOR A NEUROPSYCHOLOGICAL ASSESSMENT PROTOCOL IN PATIENTS WITH BRAIN TUMORS

Variable	Test evaluation
CARE AND GUIDANCE	
Orientation	Orientation Scales, WSM-III
attention span	WSM-III digit subscale
Selective attention	Cancel task
Alternating care	Part B Trail Making Test
Information processing speed and psychomotor function	Part A Trail MAking Test
VISUOSPECIAL ABILITIES	
Visual recognition of objects and distinguishing details	WAIS-III Complex Figures Subscale
Visual-constructive ability	King complex figure: - Representation copy of a complex model external
LINGUISTIC FUNCTIONS	
Semantic categorical fluency	Semantic categorical evocation task
Verbal nomination by confrontation	Boston Vocabulary Test
Verbal comprehension	Token Test
MNESIC FUNCTIONS	
Verbal fixation level: Immediate verbal memory	
Verbal short-term episodic memory:	Spain-Complutense Verbal Learning Test, since it currently has a parallel form.
Verbal long-term episodic memory	
Verbal recognition	
Visual episodic memory	King Complex Figure
EXECUTIVE FUNCTIONS	
Inhibition	Stroop test
Abstract thinking	WAIS Similarities
Auditory working memory	WSM-III Letters and Numbers Subscale
Planning skill	Tower of Hanoi Test
Fluency and generation of alternatives	Verbal phonological fluency task (FAS)
EMOTIONAL VARIABLES	
Anxiety	HADS
Depression	
Frontal symptoms and personality changes	Interview for the patient and a family member on the BADS scale (DEX)
Psychiatric symptoms	Neuropsychiatric Inventory
OTHER VARIABLES	
Medical/clinical issues to consider in the neurocognitive performance and emotional symptoms of patients with brain tumors	Structured interview and medical history: Degree of malignancy, laterality, personal history, epileptic seizures, corticosteroid therapy and disease situation (progression vs non-progression)

Source: MEC, Short Portable Inventory

When there is severe cognitive impairment and it is not possible to apply these questionnaires, it is considered relevant to carry out an assessment of functional performance, for this purpose the following are proposed:

Cognitive performance *screening* instrument : MEC, Short Portable Inventory.

Functional performance scales:

Lawton and Brody Advanced Activities of Daily Living.

Basic activities of daily living for Katz.