



FOCUSING ON TUMORS

Meningioma



American Brain Tumor Association

A Word About ABTA

Founded in 1973, the not-for-profit **American Brain Tumor Association** has a proud history of funding research, providing patient services, and educating people about brain tumors. Our mission is to eliminate brain tumors through research and to meet the needs of brain tumor patients and their families.

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Introduction

Although meningiomas are called brain tumors, they do not grow from brain tissue. They arise from the meninges, three thin layers of tissue covering the brain and spinal cord. These tumors most commonly grow inward causing pressure on the brain or spinal cord, but they may also grow outward toward the skull, causing it to thicken. Most meningiomas are benign, slow-growing tumors. Some contain cysts (sacs of fluid), calcifications (mineral deposits), or tightly packed bunches of blood vessels.

There are several systems used to name, or group, these tumors. One system names meningiomas by the type of cells in the tumor. Syncytial (or meningothelial) meningiomas are the most common and feature unusually plump cells. Fibroblastic meningiomas feature long, thin shaped cells. Transitional meningiomas contain both types of cells.

Another system uses the terms benign, atypical, and malignant (or anaplastic) to describe the overall grade of meningiomas. In this system, benign meningiomas contain easily recognized, well-differentiated (resembling normal) cell types which tend to grow slowly. These tumors represent about 80% of meningiomas. Atypical tumors represent 10-20% of meningiomas. They contain proliferating cells that may be faster growing and more likely to grow back after treatment, even after seemingly complete resection. Therefore, these tumors must be followed carefully for early signs of recurrence. Malignant or “anaplastic” tumors are poorly differentiated forms that often recur rapidly. Fortunately, they are quite rare (1-2% of meningiomas), but can be highly aggressive and therapeutically challenging.

Another common practice is to attach the location of the tumor to its name. For example, a parasagittal meningioma is located near the sagittal sinus, a

major blood vessel at the top of the cerebral hemispheres. A sphenoid ridge meningioma is found along the ridge of bone behind the eyes and nose. Some meningiomas pose problems despite their benign nature, because they are difficult to remove when they are located in functionally sensitive or hard to reach areas. Radiation therapy and stereotactic radiosurgery may be particularly helpful in some of these situations.

MENINGES

THE THREE LAYERS OF MENINGES

Dura mater
Arachnoid
Pia mater

PARASAGITTAL REGION

SUBARACHNOID SPACE

TENTORIUM

POSTERIOR FOSSA

CEREBELLO-PONTINE ANGLE

SPINAL CORD

Incidence

Meningiomas account for about 20% of all primary brain tumors, which are tumors that begin in the brain or its coverings. They are most likely to be diagnosed in adults older than 60 years of age, and the incidence appears to increase with age. Meningiomas are rarely found in children. They occur about twice as often in women as in men.

Cause

Researchers are studying several theories about the possible origins of meningiomas. Between 40% and 80% of meningiomas contain an abnormal chromosome 22. This chromosome is normally involved in suppressing tumor growth. The cause of this abnormality is not known. Meningiomas also frequently have extra copies of the platelet-derived growth factor (PDGFR) and epidermal growth factor receptors (EGFR) which may contribute to the growth of these tumors.

Previous radiation to the head, a history of breast cancer, or neurofibromatosis type 2 may be risk factors for developing meningioma. Multiple meningiomas occur in 5% to 15% of patients, particularly those with neurofibromatosis type 2.

Some meningiomas have receptors that interact with the sex hormones progesterone, androgen, and less commonly, estrogen. The expression of progesterone receptor is seen most often in benign meningiomas, both in men and women. The function of these receptors is not fully understood, and thus, it is often challenging for doctors to advise their female patients about the use of hormones if they have a history of a meningioma. Although the exact role of hormones in the growth of meningiomas has not been determined, researchers have observed that occasionally meningiomas may grow faster during pregnancy.

If you have questions about using hormone replacement therapy (HRT) during menopause, please discuss your concerns with your doctors. Together, you can weigh the benefits and risks in light of your individual health situation.

Symptoms

Meningiomas are usually slow growing, and may grow to a large size before causing symptoms. These tumors are most often found in the coverings of the parasagittal/falcine region (near the top of the brain) and the convexity (the outer curve) of the brain. Other common sites include the sphenoid ridge at the bottom of the brain, called the skull base.

As the tumor grows, it may interfere with the normal functions of the brain. The symptoms will depend on the location of the tumor. The first symptoms are usually due to increased pressure on the brain caused by the growing tumor. Headache and weakness in an arm or leg are the most common, although seizures, personality changes, or visual problems may also occur. Pain and loss of sensation or weakness in the arms or legs are the most common symptoms of spinal cord meningioma.

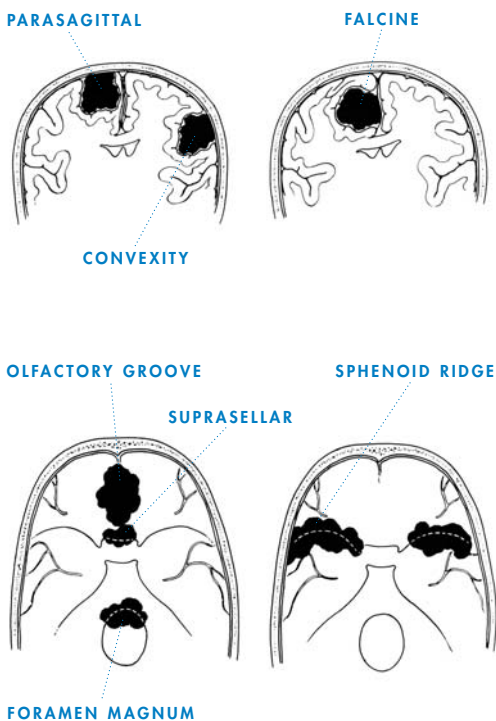
Extensive information about the parts of the brain and what they control is available in our book, *A Primer of Brain Tumors*.

Diagnosis

Your doctor will begin with a neurological examination, followed by an MRI and/or a CT scan. MR angiography (a MRI scan of the blood vessels) or an arteriogram (a blood vessel X-ray) may be performed to help the doctors plan an embolization, a procedure to block the blood vessels in the tumor. Used for tumors that have an extensive blood supply, embolization may help reduce bleeding during surgery.

If you have a tumor, these tests help your doctor determine the location, size, and probable type of tumor. However, only an examination of a sample of tumor tissue under a microscope confirms the exact diagnosis. Such a tissue sample can only be obtained through a surgical biopsy or excision.

COMMON LOCATIONS OF MENINGIOMAS



Burger, Scheithauer, and Vogel. *Surgical Pathology of the Nervous System and Its Coverings*. Fourth Edition. Churchill Livingstone, New York, 2002. Diagram reproduced with permission

Treatment

SURGERY

Surgery is the primary treatment for meningiomas located in an accessible area of the brain or spinal cord, although some tumors may be inoperable. Another factor that neurosurgeons consider is whether your vital organs (heart, lungs, kidneys and liver) are strong enough to withstand anesthesia and surgery.

The goals of surgery are to obtain tumor tissue for diagnosis and to remove as much tumor as possible. If the tumor cannot be removed, a biopsy to obtain a sample of tumor tissue may be performed.

A computer program that combines different MR images taken before surgery may be used to make a three-dimensional, or stereotactic, map of your brain. This map helps the neurosurgeon plan the surgery to remove as much of the tumor as possible while avoiding parts of the brain that control vital functions.

During the operation, the surgeon may use stereotactic imaging and instrument-guiding technologies to navigate through the brain. Occasionally, surgery is performed within a specialized MRI (intraoperative MRI) which allows the surgeon to view the tumor during the operation and determine the extent of tumor that is removed. High-powered microscopes may be used to help the surgeon to better see the tumor. Ultrasonic aspirators are used to break up and suction out parts of the tumor.

In cases where the tumor cannot be removed completely, partial removal can help decrease symptoms. Radiation may then be used to treat the remaining tumor.

RADIATION

Radiation therapy may be used for inoperable tumors, tumors that are not completely removed in surgery, malignant tumors, or recurrent tumors. There are different types of radiation that use various doses and schedules. Most forms of radiation, however, are aimed at the tumor and a small area around the tumor.

Conventional external beam radiation is “standard” radiation given 5 days a week for 5 or 6 weeks. A form of “local radiation” may be used instead of, or to boost conventional radiation. Stereotactic radiosurgery aims converged beams of radiation at

the tumor. Intensity modulated radiation therapy, also called IMRT, conforms radiation beams to the shape of the tumor.

Stereotactic radiosurgery utilizes numerous finely focused beams of radiation to accurately administer a single high-dose treatment to the tumor, while minimizing the effects to adjacent normal tissue. Therefore, despite the name, this is a non-invasive procedure and there is no real surgery involved. This may be particularly advantageous for patients that are poor surgical candidates, have tumors in high-risk regions of the brain, or have recurrences that are no longer amenable to conventional forms of surgical and radiation therapies. The disadvantages are that the technique may only inhibit further growth, stabilizing — rather than killing or removing — the tumor; and the technique is limited to relatively small tumors, usually those that are less than 3 cm. in size.

For large tumors, or tumors located close to critical structures, stereotactic radiotherapy is often used instead. While stereotactic radiosurgery involves the use of a single large dose of focused radiation, stereotactic *radiotherapy* involves the administration of smaller doses of focused radiation over a longer period of time (up to several weeks). This reduces the potential for swelling or injury to surrounding structures. Additional information about these forms of radiation therapy is available from our office.

OTHER TREATMENTS

Some treatments are offered in organized research studies called clinical trials. These are generally used for inoperable tumors resistant to radiation. Your doctor can determine if you are a candidate for treatment in one of these trials.

Interferon is being studied as an angiogenesis inhibitor. The goal of that research is to stop the growth of blood vessels that nourish the tumor.

Interferon may be offered to those with recurrent tumors and those with malignant meningiomas. Hydroxyurea, used as a radiosensitizing drug in the treatment of other types of tumors, appears to also be capable of starting the process of cell death, or apoptosis, in some meningiomas. Inhibitors of the progesterone receptors, such as RU-486, have also been evaluated as a treatment for meningiomas. While early studies showed promise, a more recent randomized trial failed to demonstrate any benefit. Targeted molecular agents including epidermal growth factor receptor (EGFR) inhibitors such as Iressa and Tarceva, platelet-derived growth factor receptor (PDGFR) inhibitors such as Gleevec, and other tyrosine kinase inhibitors are being tested in clinical trials to determine if blocking their effect on the proteins involved in tumor growth may be helpful. Most of these studies are open to people with recurrent or inoperable meningiomas.

There are also several drugs used to treat the symptoms of a brain tumor. Steroids are used to decrease swelling, or edema, around the tumor. Anti-epilepsy drugs control seizures. Anti-emetic drugs prevent vomiting and help control nausea. Additional suggestions for managing side effects are offered in our Focusing on Treatment publication series and are available from our office.

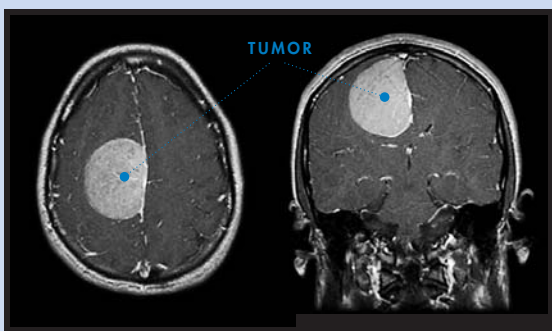
WATCHFUL WAITING

Depending on the location of the tumor, symptoms caused by the tumor, and sometimes patient preference, some meningiomas may be carefully watched. Scans will be recommended during the time of observation, and it is very important to be sure those scans are done. If your doctor suggests a course of observation, remember that any new or changed symptoms should be promptly reported to your doctor.

Recurrence

Most meningiomas are benign and treatable with surgery. However, brain tumors can recur when all of the tumor cells cannot be removed with surgery or killed with other treatments. Over time, those cells multiply and result in tumor regrowth. Your doctor can talk with you about the chances of your tumor recurring. In general, at five years following surgery about 5% of completely resected benign meningiomas, 30% of partially resected benign meningiomas, and 40% of atypical meningiomas have recurred. Although rare, it is also possible that the meningioma may recur as a more aggressive, or higher grade, tumor.

MRI OF A MENINGIOMA



Two views of a meningioma arising from the right side of the falx.

MRI scans courtesy of Dr. Wen

Depending on your general health and the growth characteristics of the tumor, another surgery and possibly radiation therapy can be considered if the tumor recurs. Focused forms of radiation therapy, such as stereotactic radiosurgery, may be repeated or used following a history of conventional radiation therapy. Treatments offered in clinical trials, such as those described under “Other Treatments,” may also be used for recurrent tumors.

Recovery

As with any brain tumor treatment, the length of recovery time varies. The age and general health of the patient, the location and size of the tumor, and the type of treatment all affect the recovery time. Prior to your surgery, ask your doctor about side effects you might expect.

Muscle coordination or speech problems may occur following surgery depending on the location of the tumor; they are often temporary. During this healing time, many brain tumor patients discover the benefits of rehabilitative medicine. The goal of rehabilitative services is to restore physical, vocational, and psychological functions. Services may include physical, occupational and speech therapy to help reduce some of the symptoms that may accompany a tumor or treatment. Cognitive retraining — a memory training method — is used to teach another part of the brain to take over the tasks of the impaired portion. Visual aids may be required for those with tumors near the optic nerves. Just as important are support services — those which help both patients and their families live with the diagnosis of a brain tumor. Our social workers can be reached at 800-886-2282. They can help you locate both rehabilitative and support services in your area.

Prognosis

People diagnosed with a meningioma often have very specific questions regarding their future. They may want to know the risks involved in their surgery, the need for follow-up care or additional treatments, if or how the tumor might affect their life, and what the chances are for their tumor recurring. Although the medical term “prognosis” is usually associated with malignant tumors, a “predication of outcome” may be more applicable to a person with a meningioma.

We encourage you to ask these outcome questions of your doctor. S/he can respond to your concerns based on your individual tumor. Your doctor can also explain your treatment plan, the benefits and risks of the treatment plan suggested for you, and what you can expect in the future.

Resources

Support groups and pen-pal programs allow you to share experiences with others in the same situation. Social workers can help you find these support networks, as well as sources of financial assistance, transportation help, rehabilitation programs and other support services. Nurses can provide you with information about how to care for yourself or your loved one. Dieticians can design a healthy eating plan to ensure your body receives the nutrients it needs during and after treatment. We can help you locate these resources in your area.

A Next Step

“Becoming Well Again Through...” is an ABTA quality of life series exploring rehabilitative medicine, memory retraining, managing fatigue, speech pathology and other resources. Please call us at 800-886-2282 for a copy of the series. Our web site — www.abta.org — offers extensive brain tumor information, treatment and research updates, and patient/family stories. The thread that runs through each of our services and programs is hope. Become involved — join us in some way, to make sure there is a cure, and ultimately, a way to prevent brain tumors.

We hope that the information in this pamphlet helps you communicate better with the people who are caring for you. Our purpose is not to provide answers; rather, we encourage you to ask questions.

Publications & Services

BUILDING KNOWLEDGE

Dictionary for Brain Tumor Patients
Living with a Brain Tumor
A Primer of Brain Tumors

FOCUSING ON TUMORS

Ependymoma
Glioblastoma Multiforme and Anaplastic Astrocytoma
Medulloblastoma
Meningioma
Metastatic Brain Tumors
Oligodendroglioma and Oligoastrocytoma
Pituitary Tumors

FOCUSING ON TREATMENT

Chemotherapy
Conventional Radiation Therapy
Stereotactic Radiosurgery
Steroids
Surgery
Physician Resource List: Physicians Offering Clinical Trials for Brain Tumors

FOR & ABOUT CHILDREN

Alex's Journey: The Story of a Child with a Brain Tumor (*Video or DVD*)
Education Packet (Parent or Teacher)
When Your Child Returns to School

SHARING RESOURCES

Bibliography
Care Options
Emergency Alert Wallet Cards
Employment Information
End-of-Life Care
Financial Aid Resources
Health Insurance Resources
Housing During Treatment Resources
Net-Working Links
Neuropsychology Resources
Scholarship & Educational Financial Aid Resources
Social Security Disability Resources
Spanish-Language Resources
Transportation Assistance Resources
Wig and Head Covering Resources
Wish Fulfillment Resources

NEWSLETTER

MessageLine Newsletter
Sharing Knowledge, Sharing Hope E-News

FOCUSING ON SUPPORT GROUPS

Listing of Brain Tumor Support Groups
Listing of Bereavement (Grief) Support Groups
Organizing and Facilitating Support Groups
Pen Pal Programs
 Connections (program for patients and family members)
 Bridges (program for those who have lost someone to a brain tumor)
Resources for Online Support
TLC (Tips for Living and Coping) e-bulletin

Single copies of our publications are available free of charge.



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