The Skull Base Center at Baylor University Medical Center at Dallas and Baylor All Saints Medical Center at Fort Worth is one of the few places in Texas that offers comprehensive treatment for the large variety of often complex pathological processes in and around the various anatomical compartments of the skull base.

The priorities of the Skull Base Center are:
- Cure or control of the disease
- Innovation
- Minimally invasive treatment
- Preservation of function
- Quality of life

A commitment to minimally invasive surgery has allowed the creation of surgical techniques that have enhanced safety, post-operative comfort and control of the patient’s disease process while reducing morbidity, length of hospital stay and the likelihood of complications.
Diseases of the Skull Base

Diseases of the skull base include a variety of pathological processes in and around the different compartments of the skull base. Skull base lesions can be located intracranially, arising from the meninges, cranial nerves, blood vessels, pituitary gland or brain tissue; or extracranially, involving the paranasal sinuses, nasal cavity, nasopharynx, parapharyngeal space, infratemporal fossa, and temporal bone. Lesions also may be located in the orbit, arising from its contents, or at the cranio-cervical spine junction where it can involve the foramen magnum and C1 and C2 vertebrae. Lesions of the skull base may include benign or malignant tumors, vascular processes (aneurysm, arterial venous malformation, cavernous malformation), congenital disorders (chiari malformation, basilar invagination), pain syndromes (trigeminal neuralgia) and rheumatological disorders (rheumatoid arthritis C1-C2 subluxation).

The Team

The Skull Base Center brings together a multidisciplinary, sub-specialized team of experts under the leadership of co-medical directors Caetano Coimbra, MD, MSc, FACS, neurosurgeon, and Yadro Ducic, MD, head and neck surgeon. This team works together to provide comprehensive and individualized care to patients with skull base lesions.

The team includes: neurosurgeons, neurotologists, head and neck surgeons, orbital surgeons, radiosurgeons, and interventional neuroradiologists.

Numerous departments and services at Baylor University Medical Center at Dallas and Baylor All Saints Medical Center at Fort Worth support the Skull Base Center, allowing comprehensive evaluation and care in the diagnosis and treatment of skull base disease.

Departments and Services Include:

- Endocrinology
- Head and Neck Oncology
- Medical Oncology
- Neurology
- Neuroradiology
- Neurosurgery
- Neurological Rehabilitation
- Otolaryngology
- Pathology
- Radiation Oncology
- Speech and swallowing therapy

Skull Base Pathologies

Intracranial Tumors
- Acoustic neurinoma
- Brainstem tumors
- Chordoma
- Chondrosarcoma
- Chorionpharyngioma
- Cerebellopontine angle tumors
- Dermoid and epidermoid tumors
- Facial nerve neurinoma
- Glomus jugulare tumor
- Lower cranial nerve meningiomas
- Pituitary tumors
- Pineal tumors
- Schwannomas
- Trigeminal nerve neurinoma
- Tumors

Vascular Lesions
- Arterial venous malformation (AVM)
- Cavernous malformation
- Cerebral Aneurism

Occipital Cervical Junction
- Chiari malformation
- Basilar invagination
- Foramen magnum tumors
- C1-C2 subluxation (rheumatoid arthritis)

Orbital Lesions
- Exophthalmus
- Fibrous dysplasia
- Hemangioblastoma
- Meningioma
- Schwannoma

Craniofacial and Sinus
- Aggressive cranio-orbital fungal sinusitis
- Carotid body tumors
- Paragangliomas
- Nasopharynx carcinoma
- Salivary malignancies
- Schwannomas
- Sinus tumors
- Squamous cell carcinoma

Non-Tumor-Related Disorders
- Cerebrospinal fluid (CSF) leaks
- Glossopharyngeal neuralgia
- Facial Spasm and paralysis
- Fibrous dysplasia
- Hemifacial Spasm
- Odontoid brainstem and spinal cord compression
- Trigeminal Neuralgia

Program Pathways

The Skull Base Center at BUMC/BAS has developed several program pathways to facilitate proper management of skull base disease.

- Acoustic Neurinoma Program
- Chiari Malformation Program
- Chordoma / chondrosarcoma Program
- CSF Leak Program
- Endonasal Endoscopic Surgery Program
- Exophthalmus Program
- Glomus / paraganglioma Program
- Head and Neck Tumor Program
- Meningioma Program
- Occipital Cervical Program
- Orbital Tumor Program
- Pituitary Tumor Program
- Trigeminal Neuralgia Program

In addition, a nurse navigator helps to streamline the transit of patients through the different departments in the center, providing the patient with personal attention and care.

For more information or to speak to the nurse navigator, call 1.800.9BAYLOR or 214.820.3900
**TREATMENT OPTIONS**

Skull base lesions present unique challenges given the complex anatomy of the region, their deeper location and their proximity to critical structures, including nerves, arteries, brain, and bone structures. The Skull Base Center is committed to seeking the best outcome for each patient with maximal preservation of function and quality of life, while using the least invasive treatment modality.

Treatment recommendations are made after careful analysis of radiological data; location and type of lesion; and evaluation of each patient’s unique health profile, needs and expectation. The treatment may include one or more of the following modalities: surgery, stereotactic radiation therapy (Gamma Knife®, CyberKnife®), interventional neuroradiology.

**RADIOSURGERY**

Patients of the Skull Base Center may receive treatment at the Baylor Radiosurgery Center in Dallas where physicians have unique expertise in Gamma Knife® and CyberKnife® radiosurgery.

Radiosurgery is a technique that uses beams of radiation carefully directed at the tumor site from many different angles, providing a large dose of radiation directly onto the tumor with minimal exposure to the surrounding healthy tissue. Radiosurgery may be used as the primary treatment for skull base tumors or as an adjuvant treatment for residual tumor after surgery.

*S* Gamma Knife and Leksell Gamma Knife are U.S. federally registered trademarks of Elekta Instruments, S.A., Geneva, Switzerland.

* Gamma Knife is owned by and leased from an affiliate of HEALTHSOUTH and is a service of Baylor All Saints Medical Center. The Gamma Knife is not a joint venture of HEALTHSOUTH and Baylor All Saints Medical Center. The physicians providing Gamma Knife services are independent physicians.

**INTERVENTIONAL NEURORADIOLOGY**

In selected cases, the interventional neuroradiology team on the medical staff at Baylor University Medical Center at Dallas, under the leadership of Joseph Hise, M.D., medical director and Baylor All Saints Medical Center provides angiographic preoperative evaluation of the feeding vessels to lesions, allowing more accurate surgical planning. In some cases, tumors with high vascularity are embolized preoperatively, allowing safer surgical resection of the tumor and less blood loss.

Patients with cerebral aneurysms are evaluated by a neurosurgeon and an interventional neuroradiologist to determine the most effective treatment modality for each patient. Treatment for cerebral aneurysms includes intravascular packing and obliteration of the aneurysm with flexible coil or craniotomy and clipping of the aneurysm. At the Skull Base Center, preference is given, whenever possible, to intravascular treatment of cerebral aneurysms, avoiding craniotomy and brain manipulation.

**SURGERY**

When surgery is necessary, preference is given to the use of minimally invasive techniques, including:

- Bi-directional approach
- Endoscopic-assisted microneurosurgery
- Focused skull base approaches
- Transfacial approach
- Transnasal Endoscopic approach

**TRANS-FACIAL AND BIDIRECTIONAL APPROACHES**

- Facial Degloving
- Head and Neck Approaches
- Reconstruction

In appropriate cases, surgeons may approach the skull base and access lesions through the face in order to minimize potential retraction of the normal brain tissue. Whenever possible, we strive to avoid any facial incisions. Many of these tumors may be removed with endoscopic transnasal techniques. When broader access is required, we perform midfacial degloving (with small incisions placed within the nose and beneath the upper lip) to access the facial skeleton. Precise osteotomies are then made in the facial bones to allow them to be moved to the side and allow for wide access to the base of the skull. The bone is reconstructed with plates and screws much as we do routinely in facial fracture management. If any bone requires removal, it is replaced with the patient’s own bone at the primary surgery if possible, to minimize any aesthetic downtime. Most patients are able to return to many of their routine activities within a couple of weeks of surgery.

For lesions that cross the anatomical borders between the intracranial and extracranial compartments, a bidirectional surgical approach using simultaneous access via focused craniotomy and transfacial or transnasal approaches allows access and control to both ends of the lesion, making surgical resection safer and more complete. In these cases, surgeons of different specialties work in a tandem and complementary fashion to provide multicompartmental access to the more complex lesion. Incisions are often made in the nasal and oral cavities to avoid facial scars and damage to the brain.
FOCUSED SKULL BASE APPROACHES and ENDOSCOPIC NEUROSURGERY

Focused skull base approaches and endoscopic-assisted microneurosurgery are used for intracranial skull base processes. These techniques allow resection of complex brain tumors such as menigiomas and cranial nerve neurinoma, which often displace or encase important nerves and arteries of the skull base and the brainstem. The use of small incisions and small cranial openings, allow the least amount of bone structures and soft tissue in and around the skull base to be disturbed. At the same time, they allow navigation outside the meninges (extradural) and under the brain, providing the most direct route to deep lesions at a specific target in the skull base. The incorporation of these techniques in the treatment of complex skull base lesions has enhanced safety, decreased post-operative discomfort and improved outcomes for patients.

**Periorbital approach:** Extensive experience with surgery of skull base lesions has allowed the neurosurgical team to use eyebrow incision in selected patients to provide minimally invasive focal periorbital approaches to target complex lesions in the region of the optic nerve, middle fossa, and internal carotid artery, such as menigiomas, trigeminal neurinoma, craniopharyngioma, and orbital tumors.

**Periauricular approach:** Small incisions around the ear take advantage of approaches through the temporal bone to access lesions in the posterior fossa, middle fossa and tentorial incisura, such as petro-clival menigioma, tentorial menigioma, trigeminal neurinoma, acoustic neurinoma, epidermoid, chordoma and chondrosarcoma. These approaches allow extradural surgical navigation under the brain causing less manipulation of the cerebellum or the temporal lobe and less trauma to the surrounding soft tissue.

**Trans-frontal sinus approach:** This technique allows skull base access to the anterior fossa invasion with minimal retraction to the frontal lobes. It avoids large frontal craniotomies for lesions in the anterior fossa, such as olfactory groove and planum sphenodalis menigioma and tumor of the sinus or nasal cavity. This technique causes less trauma to the brain and the veins and arteries of the frontal lobe.

**Trans-nasal endoscopic approach:** This approach provides access to extracranial lesions in the skull base and to pituitary tumors through the nasal cavity using endoscopic techniques. It permits endoscopic navigation, visualization of the skull base and resection of extracranial lesions, such as clival chordomas or chondrosarcomas, pituitary tumors and repair of CSF leak, with minimal trauma to facial structures. Entering through this manor, there is no manipulation of the brain, and the need for a craniotomy is avoided.

**Endoscopic-assisted microneurosurgery:** This technique is used in combination with focused skull base approaches to allow the surgeon to see around the corners of important neuro and vascular anatomical structures without having to move them or enlarge the surgical approach.

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**Selected Skull Base Cases**

**LEFT PETRO-CLIVAL MENINGIOMA**
Resection through periauricular approach

**PITUITARY TUMOR**
Resection through trans-nasal endoscopic approach

**ANTERIOR CLINOID MENINGIOMA**
Resection through periorbital approach

**OLFACTORY GROOVE MENINGIOMA**
Resection through trans-frontal sinus approach
For more information or to schedule an assessment, contact the Skull Base Center at 1.800.9BAYLOR or 214.820.3900. BaylorHealth.com
Physicians are members of the medical staff at one of Baylor Health Care System’s subsidiary, community or affiliated medical centers and are neither employees nor agents of those medical centers, Baylor University Medical Center at Dallas or Baylor Health Care System.