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Skull Base Tumors

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Summary

Skull base tumors are rare, accounting for less than 1% of intracranial tumors. Management options include a conservative approach with serial scans, conventional surgery or radiotherapy/stereotactic radiosurgery. Surgery is difficult because of problems with access, involvement of basal blood vessels/cranial nerves and the potential for post-operative cerebrospinal fluid leakage.

This book contains other chapters that deal specifically with the management of:

- Sellar and parasellar tumors.
- Meningiomas.
- Cerebellopontine angle tumors.

Clearly, these tumors comprise a large number of the cases that a skull base team will see. Readers are therefore referred to other chapters for those specific lesions, and we will deal only with those tumors of the skull base not included in the above.

In the past, the skull base has been a surgical “no-man’s land”, and the discipline of skull base surgery owes its development to individuals in many disciplines who were prepared to tackle the almost impossible problems confronting them at the time. It began near the turn of the century, with resections of acoustic tumors and approaches to the pituitary. It was not until the pioneering work of Ketcham et al. [1], whose first report appeared in 1963, that co-ordinated efforts between surgical disciplines produced the first series of skull base procedures.

The modern skull base unit comprises a multidisciplinary team, which will include (as a minimum) a neuroradiologist, neurosurgeon, otolaryngologist, plastic and reconstructive surgeon, neuroanaesthetist and intensive care specialist. Nursing and ancillary staff with an interest in neurosurgical/neurological rehabilitation is also mandatory. No one surgeon can obtain, much less sustain, all the skills required to deal with all lesions in this area. Multi-disciplinary management is the only approach that is likely to lead to improved outcomes for patients with these difficult problems – successful skull base surgery is a team effort!

The surgery involved in skull base tumors is often lengthy. The teamwork helps not only in bringing together expertise from different specialties but also provides an opportunity for intermittent relaxation during a prolonged surgical procedure.

Whatever the make up of the skull base team, the neurosurgeon often assumes a major responsibility for the patients in the post-operative period, as the majority of the major complications are related to the brain and its coverings.
Presentation of Patients with Skull Base Lesions

Lesions at the skull base are often occult and not easily diagnosed early. Symptomatology varies greatly, depending on the size, site and nature of the tumor.

Lesions of the Anterior Cranial Fossa

Localizing symptoms of lesions in the anterior fossa often include nasal or visual dysfunction. Symptoms may include nasal obstruction as well as pain, epistaxis and hyposmia/anosmia. Optic problems may include visual loss (acuity or visual field), diplopia and proptosis. For lesions involving the frontal lobes, alteration in personality, memory and concentration may also be apparent, especially with bi-frontal changes.

Examination should include endoscopy of the nose/nasopharynx, as well as a full neurological examination.

Lesions of the Middle Cranial Fossa

These may be divided into sphenoid/parasellar mid-line lesions (including nasopharyngeal lesions), and pathologies affecting the true middle cranial fossae on either side of the mid-line structures. The sphenoid lesions may present with endocrine abnormalities through effects on the pituitary and/or cranial neuropathies of nerves II, III, IV, V and VI through effects on the cavernous sinus. Nasopharyngeal lesions may present with nasal symptoms or otologic problems related to secondary Eustachian tube dysfunction, as well as a trigeminal neuropathy. Finally, if more laterally placed, symptoms due to temporal lobe involvement may be apparent, including seizures and visual field defects.

Lesions of the Posterior Fossa

Symptoms and signs of pathology in the posterior fossa are related primarily to dysfunction in cranial nerves V–XII, changes due to brain stem compression and cerebellar ataxia. Symptoms may include facial nerve weakness/spasm, hearing loss, tinnitus and imbalance, dysphonia and dysphagia. In association with larger tumors, patients may develop symptoms of raised intracranial pressure due to hydrocephalus.

In many instances, the pathological diagnosis of a skull base tumor has rested entirely on its imaging characteristics, unless it arises from a site accessible to biopsy, e.g. a paranasal sinus tumor with a nasal component. Increasingly, pathology involving the anterior and middle fossa is amenable to endoscopic biopsy via the nose/nasopharynx/paranasal sinuses. Reliance on imaging characteristics alone is therefore becoming less common. (In our unit, endoscopic biopsy via the paranasal sinuses has led to the pre-operative histologic diagnosis of trigeminal neuroma, lymphoma, meningioma, fibrous dysplasia, ossifying fibroma, plasmacytoma, chordoma and secondary renal carcinoma.)

Imaging of the Skull Base

The skull base represents a bony partition between the intracranial cavity and the orbits, nose, paranasal sinuses, nasopharynx and ear. Imaging characteristics are important in establishing:

- The anatomic location and identity of the tumor.
- The extent of the tumor, especially in relation to the major vessels and cranial nerves, dura and intracranial structures.

MRI and CT are complementary in most areas of evaluation of skull base lesions.

CT is better at detecting calcification and at evaluating the effect of tumors on the bone of the skull base. It can be particularly helpful as part of the assessment of the paranasal sinuses and the temporal bone, and where the tumor is itself calcified. Its disadvantages consist mainly of the inadequately detailed display of intracranial structures.

MRI is superior in demonstrating the relationship of a skull base tumor to soft tissue structures, the carotid artery, sigmoid sinus/internal jugular vein, dura and brain. As far as the carotid artery is concerned, MRA is helpful