Pterional/Lateral Approach to Orbital Tumors

Abstract—The purpose of this article is to detail our experience with an approach to primary pathologic conditions involving the orbit. In 27 patients these included tumors of the lacrimal gland, lymphangiomas, neurinomas, meningiomas, and various cysts of the orbit. Access to these lesions was gained by a lateral pterional approach with osteoclastic or osteoplastic removal of the lateral bony wall/roof of the orbit, and by entering adnexal contents following elevation of the lateral rectus muscle. This approach allowed for complete tumor removal in all patients. The specifics of this approach will be discussed and associated orbital complications will be detailed. (*Skull Base Surgery*, 4(2):72–75, 1994)

Various approaches have been advocated to access orbital tumors, including a subfrontal approach that allows superior access to the tumor, external ethmoidectomy allowing for medial access to tumors, and a transfacial lateral approach particularly useful for lateral orbital pathologic states or tumors of the lacrimal gland.^{1–10} A small pterional approach has been utilized in cases of frontal basal tumors, aneurysms, and for decompression of the endocrine orbitopathy of Grave's disease.^{3,11–13} This approach to the orbit was originally described over 40 years ago by French authors.^{14,15} Dissatisfaction with the previously mentioned approaches to the orbit prompted us to explore further the possibilities of a pterional/lateral approach to tumors involving the sphenoid and lateral orbit.

MATERIALS AND METHODS

Between 1989 and 1991, 27 patients were operated on in our various institutions utilizing the osteoclastic approach in ten patients and the osteoplastic approach in 17 patients. The osteoclastic approach was used in four patients with lacrimal gland disease extending posteriorly (three with chronic inflammations, and one with a mixed

tumor), in three patients with hemangiomas, in one patient with a cyst of the optic nerve sheath, in one patient with a post-traumatic cyst, and in one patient with a hemangiopericytoma (Figs. 1, 2). The osteoplastic approach was utilized in two patients with lacrimal gland disease (one chronic infection and one adenoid cystic carcinoma), for six hemangiomas, two neurinomas, three meningiomas of the optic nerve sheath, one meningioma of the sphenoid wing, two metastases of squamous cell carcinomas, and one metastasis of a hypernephroma.

SURGICAL TECHNIQUE

After head fixation in the Mayfield clamp, the skin incision is placed along or in the hair line starting in the preauricular region. Care is taken not to damage the frontal branch of cranial nerve VII by keeping the anterior dissection strictly on the fascia of the temporalis musculature. The skin flap developed is then turned anteriorly until the zygomatic process of the frontal bone and the frontal process of the zygoma are exposed. The fascia of the temporalis muscle is then resected at the anterior part of the superior temporal line and zygoma in order that the muscle may be retracted to expose the temporal fossa. For

Figure 1. Hemangioma of the right orbit, preoperative axial computed tomography scan without contrast.

anterolateral pathologic conditions, an osteoplastic removal of the lateral orbital rim together with the lateral orbital wall is performed.¹³ For better replacement, suture holes are drilled prior to bony removal. The periorbita is incised and the tumor is removed using standard microsurgical technique (Fig. 3).

For pathologic conditions involving the posterior lateral orbit or the orbital apex, an osteoclastic removal of the greater sphenoid wing is performed using a diamond burr until the frontal and temporal dura are exposed.¹² The lateral half of the lesser sphenoid wing is removed also under microscopic control. Subsequently, the lateral half of the orbital roof and the superior orbital fissure are identified. The periorbita is incised and the adnexal contents are entered following elevation of the lateral rectus muscle or lateral to the superior rectus muscle. The skin

flap is next reflected back into position prior to suture closure. A Hemovac drain is inserted in each case and perioperative antibiotic prophylaxis is administered.

RESULTS

Complications include temporary deficits of the frontal branch of cranial nerve VII in eight patients, permanent deficits of this same branch in two patients, and hematomas in three other patients. Orbital neuropathies exceeding the preoperative deficits included temporary hypesthesia of the maxillary division of nerve V in two patients, ocular motor paresthesia in two patients, afferent pupillary defect in one patient, temporary palsy of cranial nerve IV, and finally temporary palsy of cranial nerve VI

Figure 2. Hemangioma of the right orbit, postoperative axial computed tomography scan without contrast.

Figure 3. Pterional approach to the orbit after temporalis muscle has been retracted. Frontal and temporal dura is exposed.

in one patient. It should be noted that all of these palsies resolved within 6 months postoperatively. Complications were dependent on the location of the orbital lesion and not on the type of approach utilized (osteoplastic versus osteoclastic). Atrophy of the temporalis muscle leading to temporal fossa wasting is theoretically possible but was avoided in these cases by only retracting the anterior portion of this muscle, thereby preserving the neurovascular bundle.

DISCUSSION

Our experience with this rediscovered, slightly modified pterional/lateral approach using the microscope has been excellent and offers several advantages. The incision is hidden in the hair line and the orbital contour is maintained, which is important when considering postoperative cosmesis. The Krönlein incision is for laterally located pathologic states, whereas the pterional/lateral approach is adaptable for laterally, superiorly, and posteriorly situated lesions that may extend to the level of the optic canal. A visible incision or scar occurs when using the Krönlein incision and, unfortunately, the temporal bone removal and the line of surgical exposure all occur in the same incisional plain. The lateral approach offers a direct access to the tumor and the optic nerve. In contrast to the subfrontal approach, no brain retraction is necessary and no problems seem to occur due to traction on the levator palpebrae muscle or cranial nerve VI, which both cross the route to the orbital contents. If needed, the

exposure can be extended posteriorly to include the optic canal. More importantly, the rate of additional orbital permanent neuropathies has been low. With this approach there exists a relatively wide space between the lateral rectus muscle and the superior rectus muscle, which further helps to decrease neural injury and allows for dissection without muscle retraction. If indicated the pterional/lateral approach may be extended posteriorly to include intradural identification of the optic nerve at the level of the chiasm.^{8,16}

Theoretically, removal of the bony roof of the orbit with the osteoclastic approach could result in pulsating exophthalmos; however, this has not been the case in our current series. Enophthalmos due to removal of the lateral orbital wall was not a problem because the temporalis muscle was repositioned filling the space lateral to the orbit at the end of the surgical procedure. In this series cerebrospinal fluid fistulas were not observed. There were no wound infections in this series and orbital emphysema was avoided because air-containing cells or a pneumatized clinoid process were not entered.

Compared with other commonly utilized techniques for approaching orbital tumors, this is strictly an extradural approach that may be extended intradurally if needed. This approach also requires a minimal amount of bony removal compared with a subfrontal approach using a cranioplasty, which further helps to decrease perioperative morbidity. This pure extradural approach, however, has some disadvantages. It offers relatively small access and requires microsurgical and microanatomic experience. It is not generally suited for lesions medial to the optic nerve. In this present series this location was extremely rare. The majority of lesions in this study extended either lateral or lateral with a supra- or infraoptic or medial extension. In those "medial" lesions it was possible to approach the tumor either above or below the optic nerve. Concerning suspected inflammatory or metastatic diseases, we now recommend the use of preoperative ultrasound-guided fine needle aspiration to confirm the diagnosis.

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