Tumors may occur in all parts of the orbit. The key to appropriate surgical management is to obtain good-quality preoperative imaging studies because even anteriorly located lesions may have posterior extensions that are not appreciated on clinical examination. Dermoid cysts, for example, may have a dumbbell shape and intracranial extension. The safest yet most direct approach should be used to reach orbital tumors or inflammatory processes. A multidisciplinary approach with extraorbital approaches is essential in complex tumors that involve multiple regions or deep-seated orbital tumors that cannot be reached by orbitotomy alone.10,16

TYPES OF TRANSORBITAL APPROACHES

There are four primary routes by which transorbital lesions can be reached: 1) the anterior orbitotomy without osteotomy (superior [eyelid, supraorbital or subbrow incision] or inferior [transconjunctival, subocular, or lower eyelid incision]), or with osteotomy of the superior orbital rim (for large lesions); 2) lateral orbitotomy; 3) medial orbitotomy; and 4) a combination of the lateral and medial orbitotomies.

ORBITAL APPROACHES

Anterior Orbitotomy

The anterior approach to the orbit is useful for lesions of the anterior two thirds of the orbit.5,7,8,12,14 This approach was devised by Knapp11 in 1874 and popularized by Benedict.2 The anterior orbitotomy is a misnomer because bone removal is often not required. A biopsy sample of infiltrating anterior orbital lesions is usually easily obtained by fine needle aspiration. If this technique fails or is unavailable, an anterior approach with incisional biopsy sampling can be performed. The place of incision is determined by the tumor location (Fig. 1). A superior mass, for instance, can be approached through an eyelid crease incision or a supraorbital or subbrow incision.

Eyelid Crease Approach for Incisional Biopsy Sampling of the Lacrimal Gland. A biopsy sample of lacrimal gland lesions, such as lymphoma, sarcoidosis, or nonspecific orbital inflammation, can be obtained through an eyelid crease incision (Fig. 2). The procedure may be performed after the patient has received a local anesthetic and intravenous sedation in some cases, although general anesthesia is usually preferred because the lacrimal gland is typically not easily anesthetized. The eyelid crease on the affected side is marked and injected with a local anesthetic. The skin and orbicularis fibers lateral to the region of the levator are incised. Hemostasis is achieved using cautery. Blunt dissection is carried down to the level of the lacrimal gland. A biopsy specimen is then obtained using an Ellman radiofrequency unit with the loop attachment, a No. 15 blade, or blunt-tipped Westcott scissors. Because the inflamed lacrimal gland can bleed briskly, care must be taken to achieve complete hemostasis prior to skin closure. A pressure patch is placed on the wound. Biopsy samples of superior extraconal lesions are acquired in a similar fashion, usually through a supraorbital incision or subbrow incision.
Subbrow Approach to Superior Orbital Lesions. The steps highlighting this approach are shown in Fig. 3. An incision is made through the lower-brow follicles, parallel to the orientation of the brow hair, to preserve as many follicles as possible. The incision is continued to the level of the orbital bone. The skin and subdermal tissues are retracted. The periosteum (periorbita) is incised and dissected from the orbital bone, and the lesion is usually immediately visible.

A pediatric Alice clamp or cryoprobe can be used to pull the lesion forward as the blunt Westcott scissors and long cotton-tipped applicators are used to release all adhesions. Hemostasis is achieved with cauterization. The periorbital incision may be closed with interrupted No. 5-0 vicryl sutures before closing the dura. A pressure patch is placed on the wound.

Superior Approach With Superior Osteotomy. The steps of this approach are illustrated in Fig. 4. Larger extraconal superior orbital lesions cannot be removed by the more simple approach. A superior osteotomy is needed. The incision is made in a subbrow or in a supraorbital position, and its horizontal extent should be generous (at least 3 cm). A combination of No. 4-0 silk sutures and retractor is used to improve visualization of the mass. The supratrochlear and supraorbital neurovascular bundles are visualized and preserved. The superior orbital rim is removed using a sagittal saw. A cryoprobe or Alice clamp is then used to remove the tumor, and the bone is replaced and secured with titanium miniplates. In cases of posterior superior orbital lesions, a craniotomy is necessary.

A transconjunctival route may be used to approach inferior orbital lesions, through a skin incision (subciliary or lower eyelid) or via an extraorbital approach. The cryoprobe is useful for extraction of deeper orbital masses.

Lateral Orbitotomy

The lateral orbitotomy is useful for retrobulbar lesions, and it can be extended for more posterior lesions. The procedure involves temporary removal of the lateral wall of
Transorbital surgical approaches

The orbit to gain access to the entire lacrimal gland and lateral, superolateral, and inferolateral tumors. Examples of lesions suited to this approach include pleomorphic adenomas and some cavernous hemangiomas.

The patient is placed in the supine position with the head turned to side opposite the lesion. A lateral orbitotomy is performed after induction of general anesthesia. A curvilinear incision is made, beginning in the lateral upper brow, extending to the midlateral orbit, and then straight back for 3 cm from the lateral canthus.

The periorbita of the lateral orbital wall is dissected from the bone with blunt periosteal elevation. The lateral canthus is tightly attached and is removed using the sharp end of the periosteal elevator, sweeping from above or below the canthus. The lateral periorbita is dissected posteriorly to the posterior one fourth of the orbit, exposing the lateral orbital wall (Fig. 5).

Angled cuts are made in the inferior and superior orbital rims, angled slightly toward each other to remove a keystone portion of bone from the lateral orbital wall. After excising the anterolateral orbital wall, removal of the pos-

The lateral orbital periorbita is identified. A traction suture is then placed under the lateral rectus muscle distally so that by pulling the traction suture the movement of the muscle can be identified under the periorbita.

A periorbital incision is made, avoiding the lateral rectus muscle (Fig. 5). The microscope is used if desired. The lateral rectus is retracted inferiorly or superiorly, depending on the tumor location. Handheld retraction is used to retract the globe anteriorly and to retract the orbital soft tissues.

When the tumor is identified, it is dissected using sharp and blunt techniques with cotton-tipped applicators, microdissection instruments, or blunt-tipped scissors. A cryoprobe with special elongated orbital tip is placed on the lesion to provide traction. The tip freezes to the tumor, but the sides of the probe do not freeze, thus allowing the probe to be placed against other tissues in the orbit without freezing them. The cryoprobe is sequentially replaced as the tumor is rolled out. It is advisable to avoid pulling the tumor with a great deal of force because this can damage the tissues around it and lead to subsequent bleeding. The process continues until the tumor is freed up entirely and can be removed.

After achieving complete hemostasis, closure is begun by smoothing the periorbita into position and verifying that the lateral rectus is intact. The periorbita need not be closed with sutures. The bone is replaced and held in posi-

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Angled cuts are made in the inferior and superior orbital rims, angled slightly toward each other to remove a keystone portion of bone from the lateral orbital wall. After excising the anterolateral orbital wall, removal of the pos-
tion by nonabsorbable No. 4-0 nylon sutures. The periorbita and the slip of temporalis and periosteum are attached at the lateral orbital margin with No. 5-0 nondyed vicryl sutures (Fig. 6). Vertical mattress sutures are used to close the subcutaneous tissue to approximate the wound edges, and the skin is closed with a running suture. A pressure patch is applied until the next morning.

**Transconjunctival Medial Orbitotomy**

The medial approach was described in 1973 by Galbraith and Sullivan to decompress the optic nerve and relieve papilledema. We have used the same approach to re-move anterior and medial tumors within the muscle cone. We have also designed a special retractor for this approach.16

The medial orbitotomy is effective in the management of small, medial orbital tumors such as cavernous hemangiomas, schwannomas, hemangiopericytomas, and isolated neurofibromas. This procedure may be used in conjunction with a sinus procedure in cases in which both regions are involved. The medial orbitotomy is performed after induction of general anesthesia. A medial peritomy in which releasing incisions are angled superiorly and inferriorly is used to expose the medial rectus muscle insertion (Fig. 7).

The medial rectus is freed from its intramuscular septum and check ligaments and imbricated with No. 6-0 vicryl suture, doubly locked at both borders, and severed from the insertion site with blunt Westcott scissors. The medial rectus is then gently retracted medially.

The medial orbital retractor is introduced, and the malleable retractor or modified enucleation spoon is used to retract the globe laterally. These can be attached to a bar of the Leyla system.

Dissection is then performed using the microscope. The microsurgical instruments, in conjunction with long cotton-tipped applicators, are used to dissect the fat deeper and deeper until the tumor is identified. Bipolar cautery is used to coagulate the the sources of blood in the medial orbital compartment and to remove the fat until the tumor is identified. When a sufficient surface area is exposed, a specially designed cryoprobe is applied to the tumor to facilitate its manipulation. Using the cryoprobe to lift the tumor, the posterior portions are progressively dissected and the tumor is finally removed. If the tumor is such that it cannot be resected intact, then it is often removed piecemeal by using a pituitary cupped forceps. Occasionally bipolar cauterization or a CO₂ laser is needed to reduce the tumor. Because direct visualization is difficult, direct palpation is often essential to confirm that the tumor is completely excised. The medial rectus is then reattached to its insertion site, and the conjunctiva is closed. A pressure patch is placed until the next morning.

**Medial Lateral Orbitotomy**

Large or posteriorly located medial orbital tumors may be resected via transorbital approaches, but they require a combined lateral–medial orbital approach. Large, primarily medial intraconal tumors are ideally suited for this approach, particularly large neurofibromas or hemangiomas located deep in the medial orbital compartment. The lateral approach is identical to the previously described approach except the lateral incision is made directly through the canthus, 3 cm posteriorly, in the fashion of Berke.5 This is done to allow the globe to be prolapsed into the bone defect laterally so that more room can be obtained medially to extract the tumor (Fig. 8).

Intraoperatively, 10 mg of Decadron and 1 gram of Ancef are administered in all cases in which orbitotomy is performed. A combination of antibiotic and steroid drops is prescribed twice daily for at least the 1st week postoperatively. Patients in whom large tumors were resected are placed on a 5-day course of prednisone postoperatively.
CONCLUSIONS

Most orbital tumors can be safely approached via the transorbital routes. They require instruments and skills that are atypical for the general ophthalmologist. The presence of important neurovascular structures within the

Fig. 6. Diagrams showing closure of the lateral orbitotomy. The orbital osteotomy is secured in place by using the predrilled holes and nonabsorbable sutures (A). The temporalis fascia and periosteum/periorbita complex are closed (B). The skin is then closed (C). Reprinted with permission from Kennerdell, et al., Practical Diagnosis and Management of Orbital Diseases. Boston: Butterworth-Heinemann, 2001.

Fig. 7. Diagrams depicting stages in a medial orbitotomy. The medial orbitomy is used for well-circumscribed lesions in the intracanal medial region (A). A medial peritomy with relaxing incisions exposes the medial rectus muscle insertion (B). The latter is freed and imbricated (C). The medial orbital retractor is placed with the enucleation spoon used to retract the globe laterally (D). The microscope is brought in and dissection performed to isolate the tumor. The ophthalmic cryoprobe is useful to hold the tumor (E). After excision of the tumor, direct palpation is often essential to confirm complete excision because direct visualization is difficult. The medial rectus is then reattached to its insertion site and the conjunctiva is at the limbal site of the relaxing incisions (F). Reprinted with permission from Kennerdell, et al., Practical Diagnosis and Management of Orbital Diseases. Boston: Butterworth-Heinemann, 2001.

Fig. 8. Diagrams illustrating step in the mediolateral orbitotomy. The medial lateral orbitotomy is ideal for large medial intracanal tumors (A). The skin incision is straight or slightly curved to follow a dominant laugh line (B). A lateral canthotomy–cantholysis is performed. The lateral rim and wall are removed, as already described in Fig. 5 (C). A medial transconjunctival orbitomy is performed, as outlined in Fig. 7 (D). The globe is retracted laterally into the defect created by the lateral orbitotomy by using a spoon retractor, and the tumor is exposed (E). Reprinted with permission from Kennerdell, et al., Practical Diagnosis and Management of Orbital Diseases. Boston: Butterworth-Heinemann, 2001.
orbital fat contents makes dissection tedious. Many of the instruments required to facilitate orbital surgery are readily available from ophthalmological and neurosurgical instrument companies. Unlike a typical ophthalmological procedure, the surgeon’s index finger is essential to palpate and occasionally provide dissection for deep masses. Cotton-tipped applicators are very helpful for performing blunt dissection and retraction when working in the orbital fat. In addition to the standard instruments that are useful in orbital tumor surgery such as the wire lid speculum, blunt Westcott scissors, the Stevens and Green hooks, other specific orbital instruments are required—malleable retractors, curved scissors and forceps with specialized 6-inch length, and a cryoprobe. There is no fixed orbital retractor system currently available that can be easily used and that is superior to manual retraction. We are currently working to develop a newer practical and efficient retractor system, which combines orbital retractors with specialized shapes and the neurosurgical Leyla system.

References

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