Chapter 19 – Orbital Complications of Endoscopic Sinus Surgery

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The usual chapter headings of patient selection and preoperative preparation are not applicable to this chapter on orbital complications. One does not select a patient to have an orbital complication. Far preferable to managing a complication is prevention of the complication. In Chapter 12, the dangers of the microdébrider are outlined. Microdébriders can cause irreparable diplopia because of injury to the extraocular muscles. Other complications include retrobulbar hemorrhage from injury to the anterior ethmoid artery. Prompt recognition and decompression of the orbit are required. Surgery on the sphenoid and posterior ethmoid sinuses may cause injury to the optic nerve, which is exposed in more than 20% of cases. Failure to appreciate an exposed optic nerve or a bony dehiscence over the optic nerve preoperatively may lead to blindness. Rarely, infection or orbital emphysema may complicate endoscopic sinus surgery (ESS). This chapter discusses these various complications and highlights recommendations for prevention, followed by techniques for management.

MICRODÉBRIDER AND ORBITAL COMPLICATIONS

Microdébriders have revolutionized ESS. They suction and then cut tissue. Unfortunately, this can lead to an increased complication rate, particularly with novice surgeons. True cutting instruments or even forceps allow the surgeon to more easily identify the tissue removed. Because of the suction and cutting aspects of the microdébrider, aspiration and removal of inappropriate tissue occur much more rapidly and potentially without identification of the tissue. The most frequent adverse outcome of use of the microdébrider is injury to the medial rectus muscle. No satisfactory corrective intervention has been established for this complication to date.[1] Similarly, although less common, intracranial complications can be caused by aspiration of dura or cranial contents.

To prevent orbital complications, the microdébrider should not be used adjacent to the lamina papyracea by an inexperienced surgeon. It is particularly risky to use the microdébrider adjacent to areas of bony dehiscence of the orbital wall. Safety of the microdébrider is enhanced by directing the mouth of the opening medially and not laterally. Frequent palpation of the eye will allow early identification of the orbit endoscopically.

RETROBULBAR HEMORRHAGE

The anterior ethmoid artery, a branch of the ophthalmic artery, traverses the lamina papyracea across the ethmoid cavity just behind the frontal recess before re-entering the cranially cavity in the cribriform fossa. If the artery is sectioned in the ethmoid fossa and retracts into the orbit, a retrobulbar hemorrhage can occur. If a retrobulbar hemorrhage does occur, the eye will become proptotic and much firmer by palpation. Gently palpating the eyes before sinus surgery will give the surgeon a baseline for orbital firmness with which to compare if a retrobulbar hemorrhage occurs. The eyes should be visible to the surgeon during the procedure and not obscured with drapes, although tape to keep the eyes closed is acceptable. In the event of retrobulbar hemorrhage, orbital pressure must be assessed. If it becomes elevated, the orbit should be decompressed. Decompression should not be postponed to have an ophthalmologist evaluate orbital pressure. If ophthalmologic consultation is not readily available and there is a high probability of increased intraocular pressure, the orbit should be decompressed. The fastest and easiest method of decompression is a lateral canthotomy with inferior cantholysis (Figs. 19-1 and 19-2). If the patient is conscious, 0.5 to 1.0 mL of lidocaine (Xylocaine) with 1:100,000 epinephrine is injected into the lateral canthus. A small hemostat is placed horizontally across the lateral canthus, the tissue is crushed, and then a 10-mm horizontal cut with sharp scissors is made in the crush mark. The scissors are then directed inferiorly until the bony rim of the orbit is felt, and the inferior cantholysis is performed. The lateral canthal tendon can also be isolated by dissecting it free from the conjunctiva posteriorly and from the skin anteriorly. The inferior crus of the lateral canthal tendon is then disinserted completely so that the lower lid is totally mobile. The orbit is not decompressed until the lower lateral canthal tendon is cut. It is important to not perform this procedure on the upper lid because the lacrimal gland and levator muscle can be damaged. The lateral canthal incision can be closed at a later date with 7-0 Vicryl or left to heal on its own. A lateral canthotomy and cantholysis are performed immediately to decompress the orbit, and are usually sufficient to prevent irreversible ocular changes.[2]

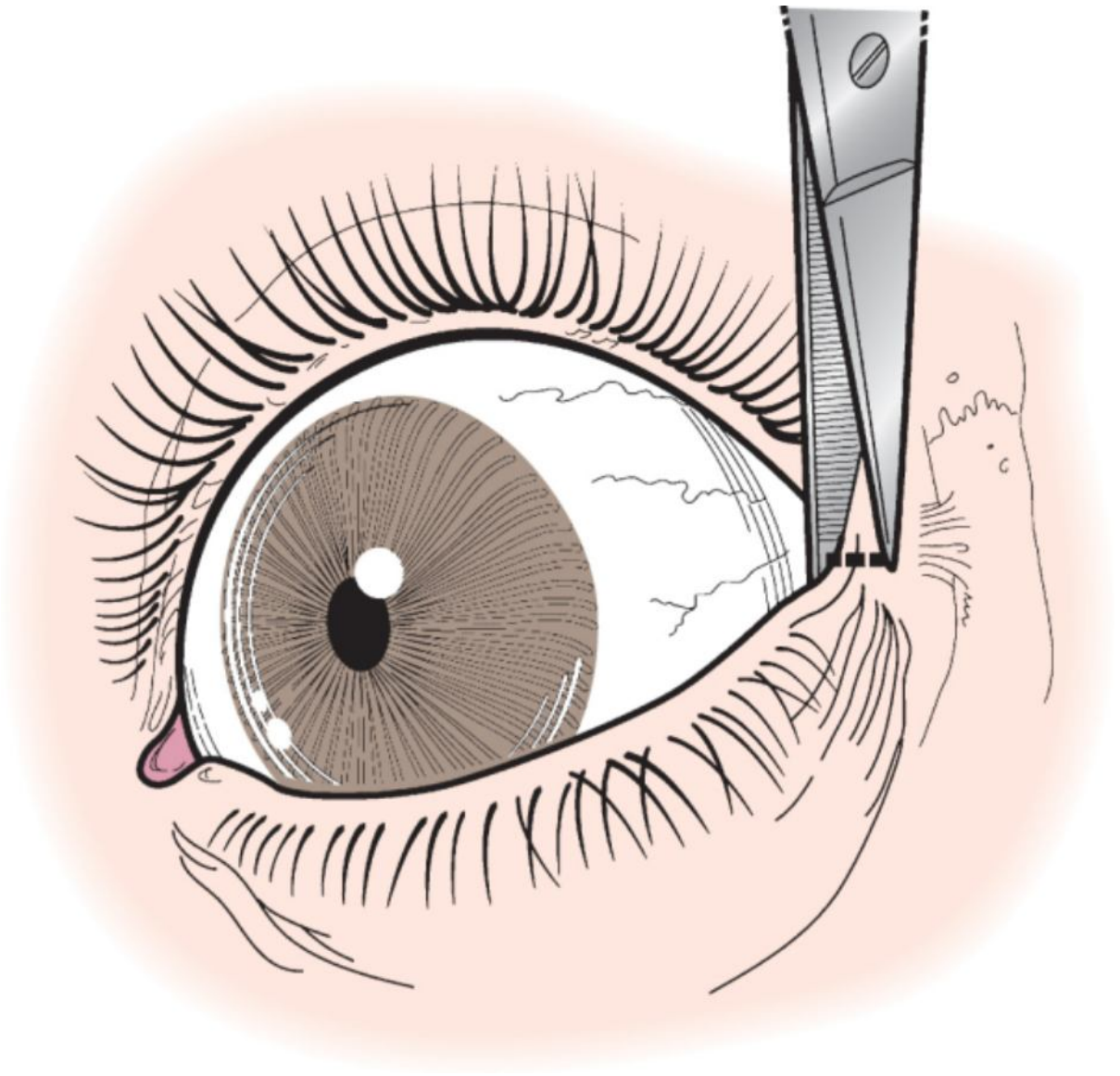

Figure 19-1 Lateral canthotomy is performed to immediately decompress the orbit.

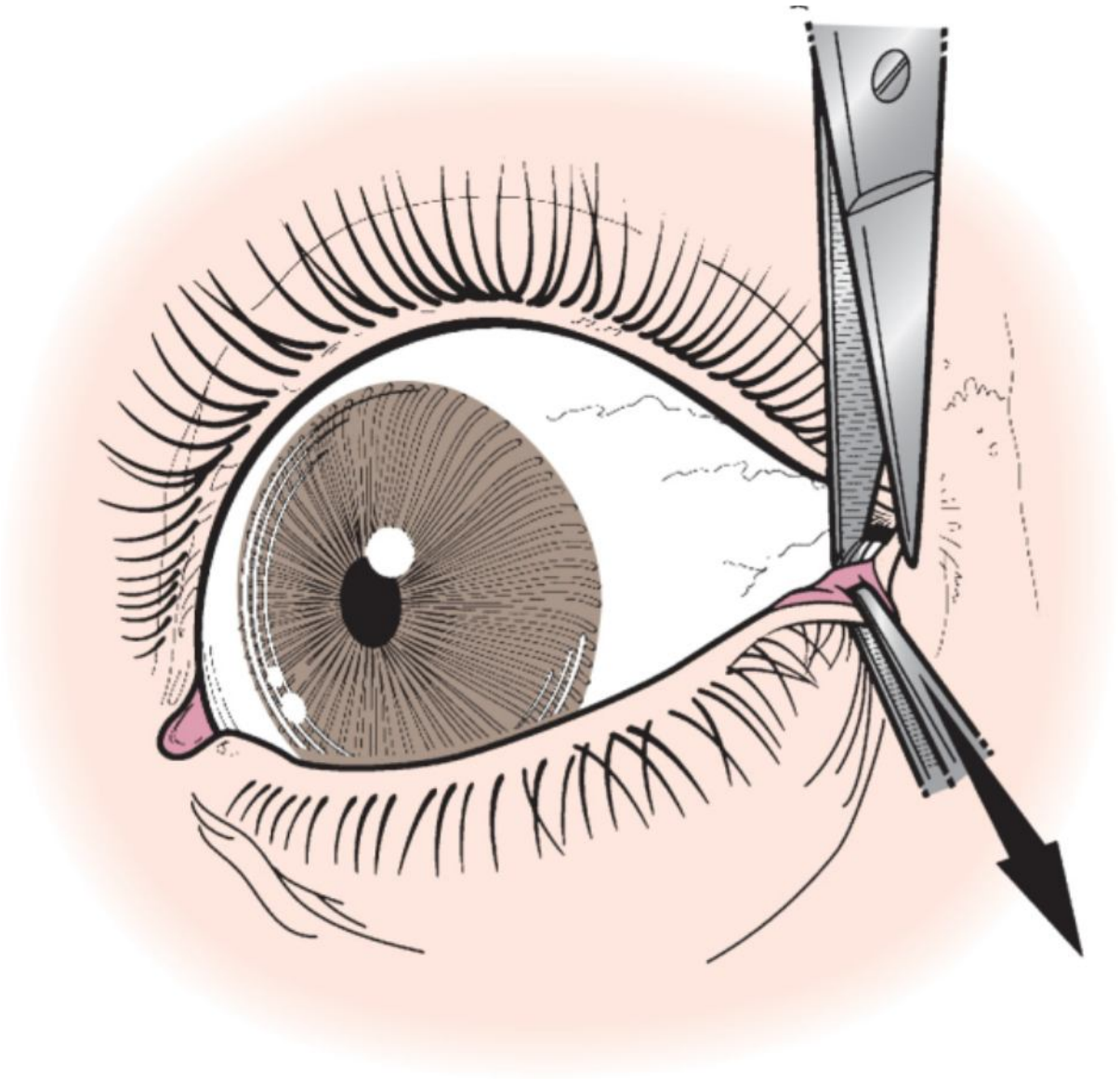

Figure 19-2 Decompression is not complete until the lower lateral crus is cut via cantholysis.

COMPLICATIONS OF THE SPHENOID AND POSTERIOR ETHMOID SINUS AND ORBIT

In an incompletely opacified sinus, delineation of the optic nerve is easier on computed tomography (CT) than in an opacified sinus. The frequency of complete dehiscence of the optic nerve in the sphenoid sinus is 6%, and an additional 3% are immediately adjacent to the sphenoid sinus and the posterior ethmoid cell (an Onodi cell) (Figs. 19-3 and 19-4). Bone dehiscence over the medial aspect of the optic nerve is more common and occurs collectively in almost 25% of patients. In all patients in whom such dehiscences occur and in patients in whom it is difficult to assess because of opacification of the sphenoid, microdébriders should either not be used or be used so that all tissue comes into the microdébrider in a direction that would preclude injury to the optic nerve. Cutting instruments and forceps should be used only with direct visualization in these areas and not blindly. There is no treatment of a transected optic nerve.

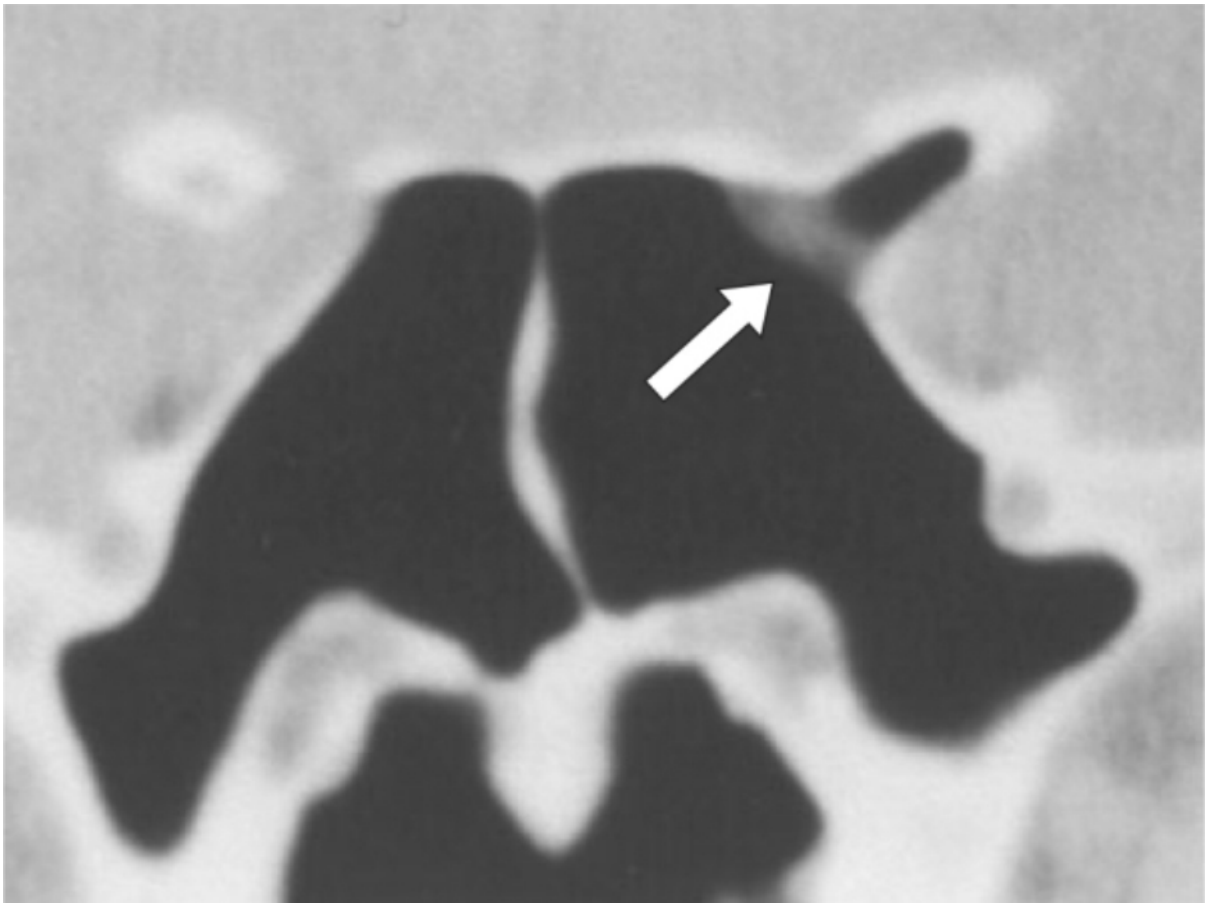

Figure 19-3 Coronal sinus computed tomography scan demonstrating a dehiscent left optic nerve *(arrow)*.

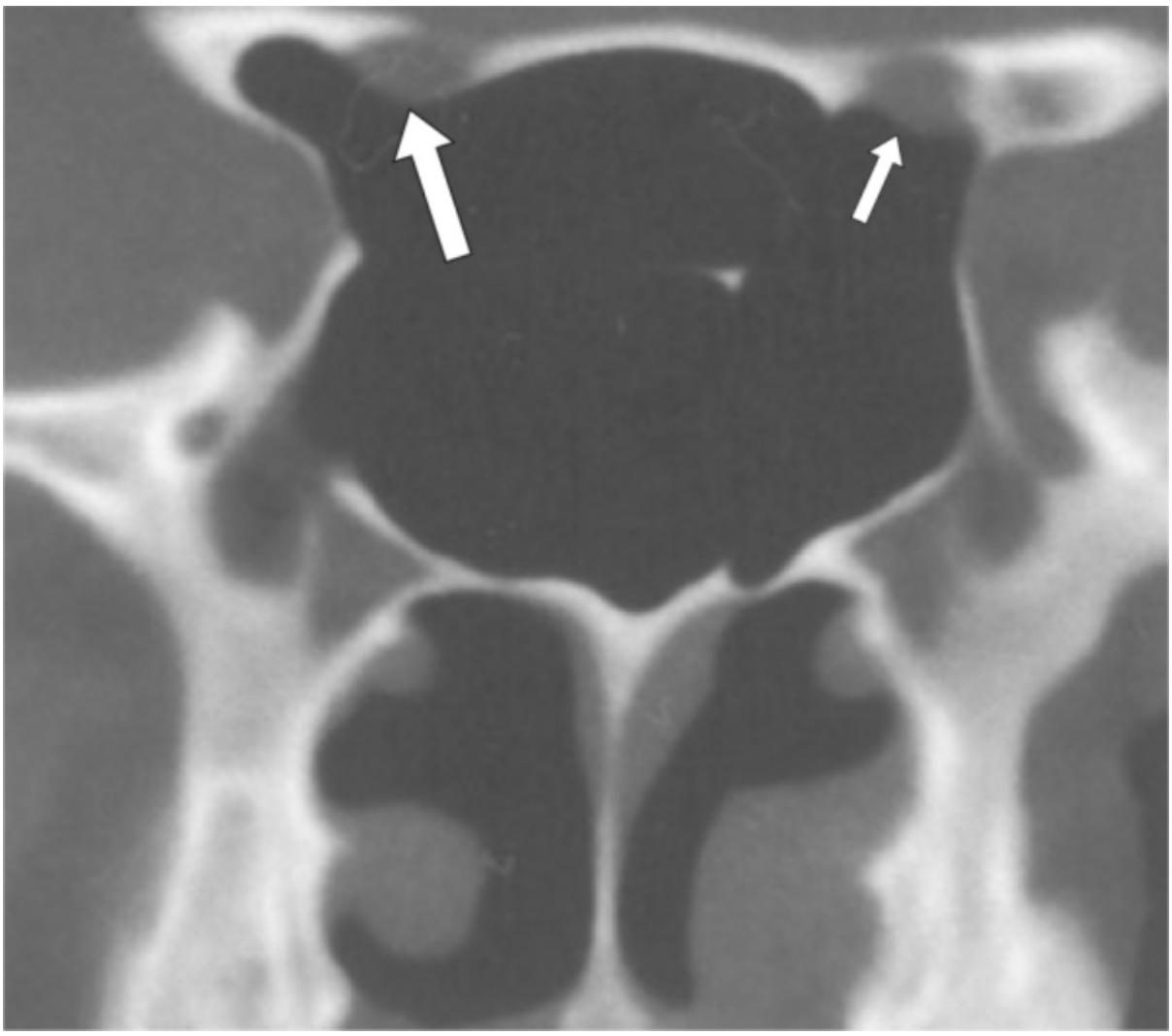

Figure 19-4 Coronal sinus computed tomography scan demonstrating bony dehiscence over the optic nerve in the sphenoid sinus on the left *(small arrow)* and a dehiscent optic nerve in the Onodi cell on the right *(large arrow)*. The right superior cell is a posterior ethmoid cell or an Onodi cell because it overrides the sphenoid cell below it.

POSTOPERATIVE ORBITAL INFECTIONS

Orbital abscesses can occur postoperatively, and postoperative orbital swelling demands evaluation of vision and extraocular movement. If the swelling precludes such evaluation, an immediate sinus CT scan should be obtained along with ophthalmologic consultation. This will conclusively distinguish preseptal from postseptal swelling. Management is similar to that for increased ocular pressure from a retrobulbar hemorrhage and consists of urgent decompression, initially with lateral canthotomy and cantholysis. In addition, Gram stain and aerobic/anaerobic culture are carried out, and empirical intravenous antibiotics directed at the usual acute pathogens are initiated. Figure 19-5 presents a CT scan of a patient with an orbital abscess and increased intraocular pressure 3 days after ESS. The patient underwent endoscopic decompression but remained blind because of the prolonged duration of increased orbital pressure (Fig. 19-6). Whether administration of antibiotics intraoperatively or postoperatively would prevent this rare complication is unknown. Certainly, if a patient has evidence of acute and active infection at the time of surgery, culture should be performed and antibiotics given intraoperatively and postoperatively to cover the usual acute pathogens.

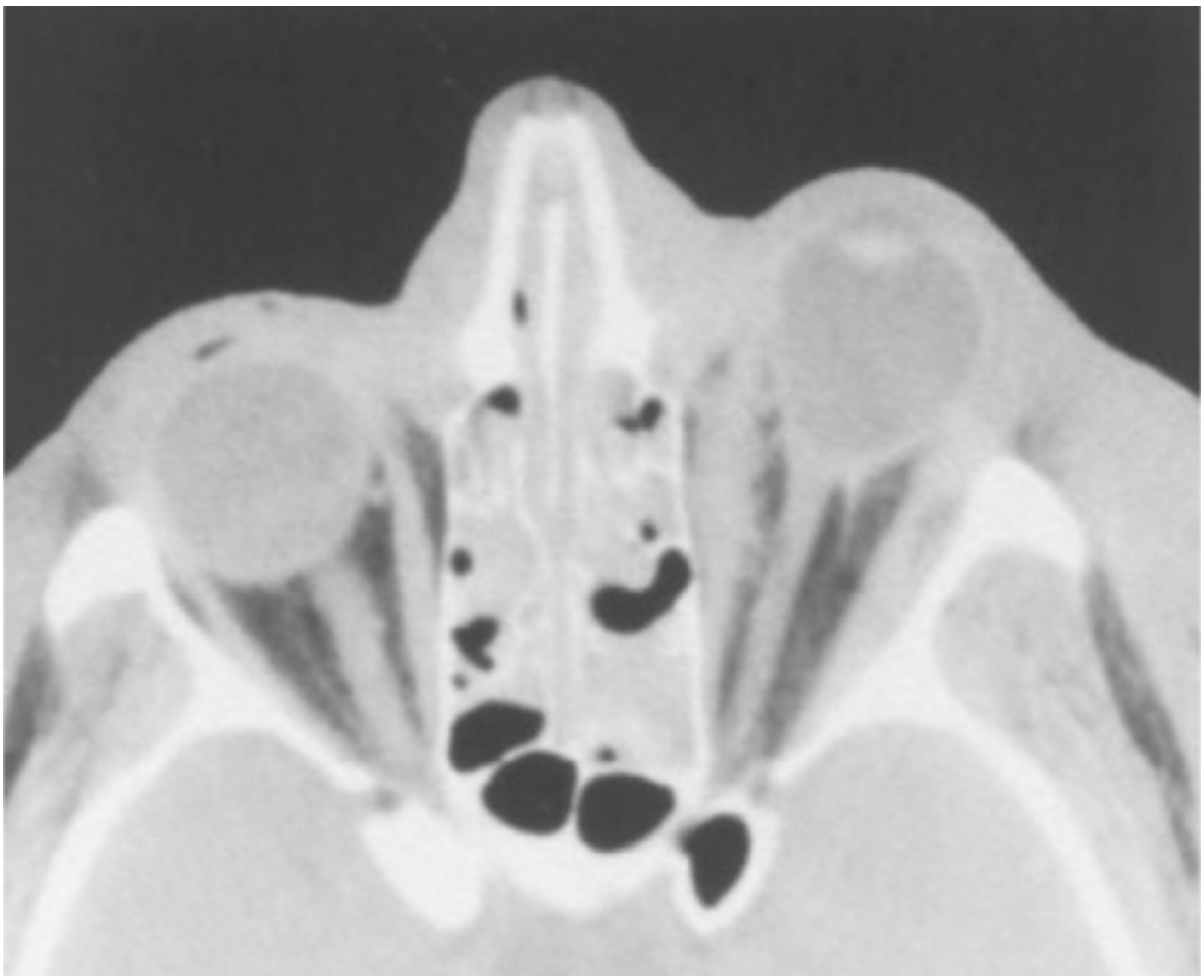

Figure 19-5 Sinus computed tomography scan 3 days after endoscopic sinus surgery demonstrating a left orbital abscess with proptosis and stretching of the left optic nerve.

Figure 19-6 The patient in Figure 19-5 is shown the following day after drainage of the abscess and decompression. Note the persistent profound proptosis and edema.

SUBCUTANEOUS EMPHYSEMA

If a patient sneezes or blows the nose in the immediate postoperative period and there is a hole in the lamina papyracea, air can be forced into the tissues of the orbit and face. Gentle ballottement of the eye may actually increase subcutaneous emphysema by creating a ball-valve effect and pump additional air into the subcutaneous tissue (Figs. 19-7 and 19-8). In general, the emphysema will resolve with watchful waiting without intervention. Rarely, the intraorbital air mass can cause central retinal artery occlusion. An early indicator of visual loss is loss of the ability to see the color red. One case of blindness secondary to orbital emphysema occurred 48 hours after ESS and was initiated by sneezing. Thus, if vision deteriorates, rapid action must be taken to prevent irreversible damage, including immediate surgery to decompress the orbit and allow air to escape. An urgent CT scan should be requested to localize the air. Surgical options include lateral canthotomy, cantholysis, and direct aspiration of the air. Additionally, intravenous steroids to reduce intraorbital inflammation and acetazolamide or mannitol to reduce intraorbital pressure have been suggested; however, no randomized controlled trials have investigated the efficacy of these treatments in this condition.[3]

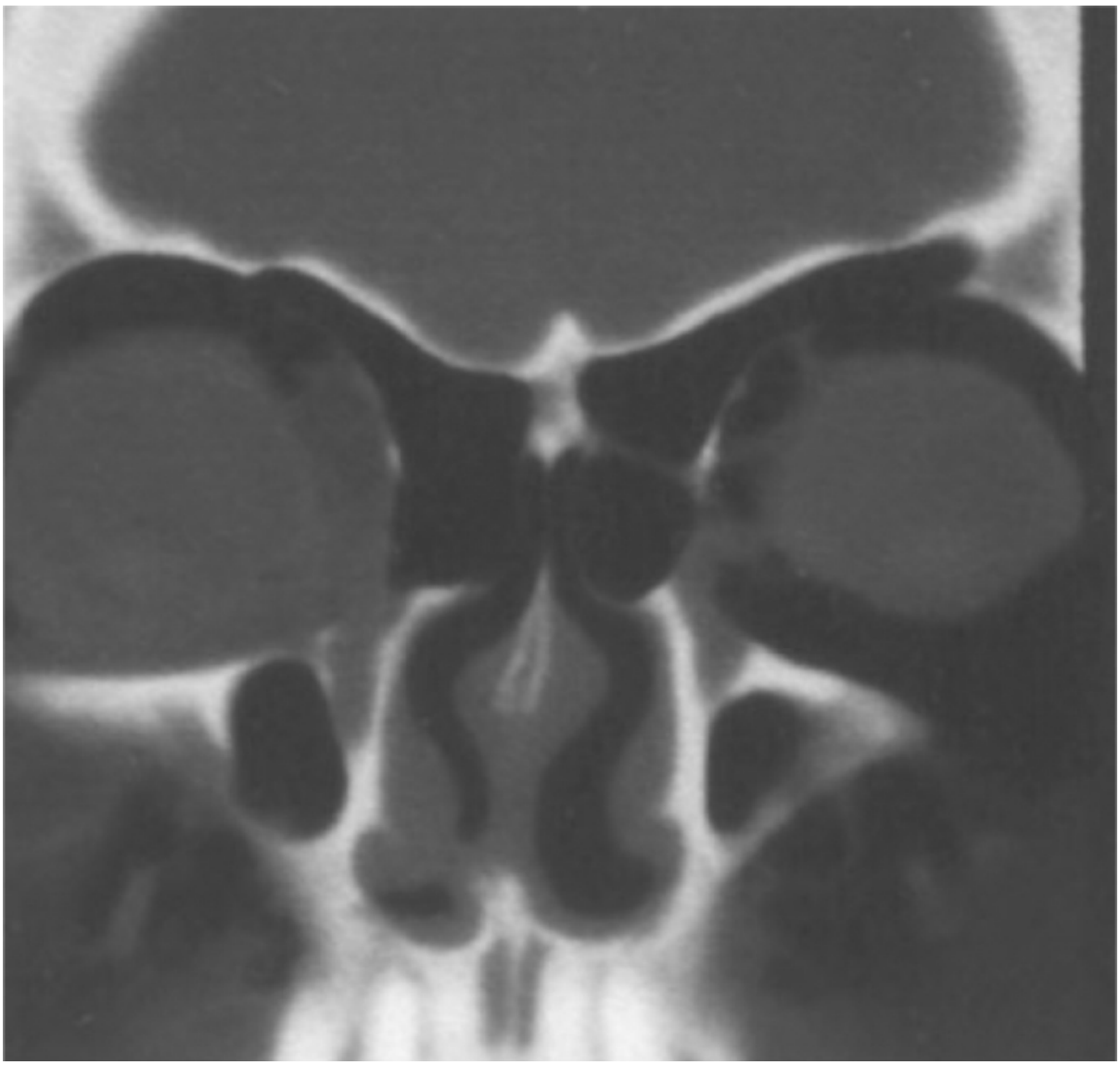

Figure 19-7 Sinus computed tomography scan demonstrating orbital and facial emphysema 6 hours after left endoscopic sinus surgery in which the lamina papyracea was disrupted. Note the air in both orbits and below the maxillary sinus. The patient blew her nose and continued to press the eye after the onset of eye swelling. This led to increased orbital and facial emphysema.

Figure 19-8 **A,** Eyes almost completely shut by orbital and facial emphysema. **B,** Ten days after the onset of emphysema the swelling has largely resolved without intervention.

In ESS, in which there is the possibility of violation of the lamina papyracea, patients are counseled to not blow their nose and to open their mouth if they must sneeze for at least 3 or 4 days postoperatively.

PEARLS

- Orbital complications can frequently be avoided by palpating or balloting the eye during the procedure and noting endoscopically whether any movement is present.
- The rare complication of subcutaneous orbital emphysema after ESS can be minimized by instructing patients to not blow their nose and to avoid sneezing with the mouth closed for the first several days postoperatively, particularly if the lamina papyracea has been violated.
- Loss of the ability to see the color red is an early indicator of visual loss.
- A lateral canthotomy with cantholysis is the fastest and easiest method to decompress the orbit.
- Lateral canthotomy does not necessarily require subsequent surgical closure.

PITFALLS

- Canthotomy alone, without cantholysis, will not adequately decompress the orbit.
- Delay of orbital decompression in the event of retrobulbar hemorrhage to obtain an ophthalmology consultation may result in blindness.

- Microdébriders can quickly cause irreparable damage to the medial rectus and should not be used adjacent to the lamina papyracea by inexperienced surgeons if vision is obscured with bleeding or if a bony dehiscence is present.
- Ballottement of the globe in the face of a dehiscent lamina papyracea and periorbita may increase subcutaneous emphysema by creating a ball-valve effect that pumps additional air into the subcutaneous tissue.