Operative Techniques in Otolaryngology (2006) 17, 201-209

Operative Techniques in
Otolaryngology

Endoscopic repair of orbital blow-out fractures

E. Bradley Strong, MD

From the Department of Otolaryngology, University of California, Davis School of Medicine, Sacramento, California.

KEYWORDS
Blow-out fracture;
Orbital fracture;
Endoscopic;
Orbital floor fracture

Orbital floor blow-out fractures occur in repeatable patterns that can be classified as either medial or lateral to the infraorbital nerve. Medial fractures are the most common and are amenable to endoscopic repair, while lateral fractures are not. The keys to successful surgical repair of these injuries are adequate exposure, complete visualization of the entire fracture, and anatomic repair of the defect. Visualization of the posterior shelf is often challenging through traditional transconjunctival and subciliary incisions. These approaches also have known risks of postoperative eyelid malposition. The transmaxillary endoscopic approach to orbital blow-out fractures offers excellent visualization of the entire orbital floor. Fracture types can be evaluated and anatomically repaired without the need for an eyelid incision. Although this is a new and evolving technique, early experience suggests that the endoscopic approach is a safe, efficacious technique for orbital blow-out fracture repair. It offers improved visualization, anatomic fracture repair, no risk of postoperative eyelid complications, and good clinical results.

Orbital floor blow-out fractures often result in prolapse of the orbital contents into the maxillary sinus.[1] Potential complications include enophthalmos, diplopia, and visual loss. Historically, a transcutaneous rim incision or a "blind" Caldwell-Luc approach was used to repair orbital blow-out fractures. Currently, transconjunctival and subciliary incisions are commonly used. These hidden incisions provide wide exposure to the orbital floor for visualization and implant placement. However, intraoperative orbital fat prolapse can make visualization of the posterior bony orbital shelf difficult. This can result in poor implant placement, postoperative enophthalmos, and extraocular muscle entrapment. Postoperative lower eyelid malposition is also known to occur in 1.2% to 42% of patients.[2-4]

A transmaxillary approach to orbital floor fractures was described by Walter in 1972.[5] He visualized the orbital floor with a headlight, repaired the fracture blindly, and maintained the reduction with strip gauze. The endoscopic, transmaxillary technique uses the same approach, but the endoscope provides improved visualization of the entire injury as well as anatomic reconstruction of the orbital floor. Several investigators have recently described individual techniques for transmaxillary endoscopic repair of orbital floor fractures.[6-10] Unfortunately, there are no standardized indications, techniques, or instrumentation for these procedures. This article reviews fracture classification, indications for surgery, and surgical technique. The author has found that the endoscopic approach provides improved fracture visualization, anatomic fracture repair, no risk of postoperative eyelid complications, and good clinical results.

Anatomy/fracture patterns

Anatomy

The infraorbital nerve (V_2) exits the foramen rotundum, traverses the pterygopalatine fossa, travels within the orbital floor, and exits the skull through the infraorbital foramen (Figure 1). The orbital floor is divided into medial and lateral segments by the infraorbital nerve (Figures 1 and 2). The medial segment is larger and more fragile. The boundaries include the inferior orbital fissure (posteriorly), bony canal of V_2 (laterally), orbital rim (anteriorly), and inferior aspect of the lamina papyracea ("laminar bar") (medially) (Figures 1 and 2). The lateral segment of the orbital floor is smaller, thicker, and stronger than the medial segment. It is bounded by the inferior orbital fissure (posteriorly), bony

Address reprint requests and correspondence: E. Bradley Strong, MD, Associate Professor, Department of Otolaryngology, University of California, Davis School of Medicine, Suite 7200, 2521 Stockton Boulevard, Sacramento, CA 95817.
E-mail address: edward.strong@ucdmc.ucdavis.edu.

1043-1810/$ -see front matter © 2006 Elsevier Inc. All rights reserved.
doi:10.1016/j.otot.2006.01.002

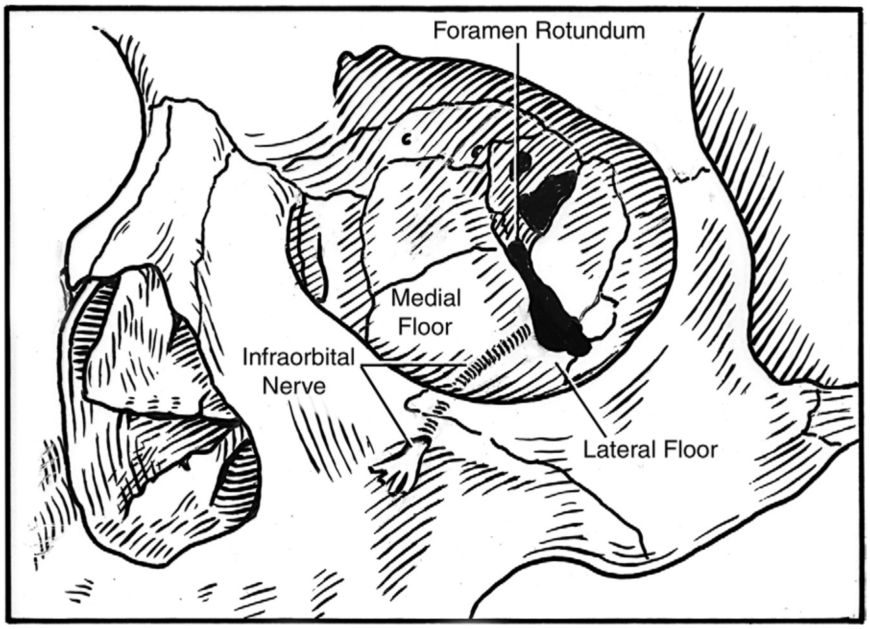

Figure 1 Orbital floor and the course of the infraorbital nerve. The nerve exits the foramen rotundum, traverses the pterygopalatine fossa, travels within the orbital floor, and exits the skull through the infraorbital foramen. The infraorbital nerve divides the orbital floor into medial and lateral segments.

canal of V_2 (medially), orbital rim (anteriorly), and lateral orbital wall (laterally) (Figures 1 and 2).

Fracture patterns

Orbital floor fractures can be endoscopically classified into 3 types: (1) trapdoor, (2) medial blow-out, and (3) lateral blow-out.[11] Trapdoor fractures occur when a large fragment of the medial orbital floor is displaced inferiorly but remains "hinged" at the laminar bar (Figure 3A). Medial blow-out fractures result in bone disruption between the laminar bar and infraorbital nerve (Figure 3B). Lateral blow-out fractures result in bone comminution from the laminar bar to the lateral orbital wall (Figure 3C).

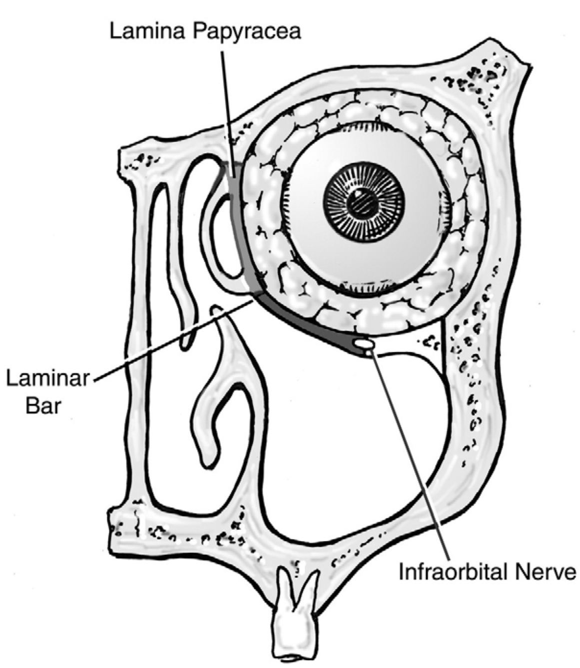

Figure 2 Coronal view of the orbit. Note that the infraorbital nerve divides the orbital floor into a medial segment (gray, long and thin) and a lateral segment (black, short and thick).

Indications for surgery

A full head and neck examination, computerized tomography (CT), photographic documentation, and ophthalmologic examination are indicated in all patients. Indications for endoscopic repair are identical to traditional repair and include: (1) isolated orbital floor injuries with extraocular muscle entrapment, (2) preoperative enophthalmos, or (3) significant disruption of the orbital floor (>50%). Trapdoor and medial blow-out fractures are the best candidates for endoscopic repair. The dissection necessary for larger defects that extend lateral to the infraorbital nerve may place the infraorbital nerve at risk for iatrogenic injury and postoperative paresthesias. Complex 2 wall fractures cannot be treated endoscopically at this time. The surgical options and techniques should be discussed with the patient (ie, open vs endoscopic repair). Appropriate informed consent should be obtained, including the possibility of a transconjunctival or subciliary incision in case the surgeon cannot repair the fracture endoscopically. Prior attempts at an endoscopic repair do not jeopardize a subsequent eyelid approach because none of the eyelid structures have been violated.

Surgical technique

A right-handed primary surgeon should be positioned on the patient's right side, with the bed turned 180° away from anesthesia. The assistant surgeon and nurse should be on the patient's left side. The monitor should be at the head of the bed. Both the surgeon and the assistant must