Endoscopic Repair of Orbital Blowout Fractures

Use or Misuse of a New Approach?

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Objective: To evaluate the successes and challenges of endoscopic orbital floor fracture repairs.

Methods: We analyzed 53 orbital floor repairs and recorded the indications for surgery, factors that complicated the endoscopic repair or necessitated conversion to an open approach, and outcomes for each.

Results: Forty-five procedures were completed endoscopically. Repairs of smaller injuries confined entirely to the medial floor were readily accomplished, particularly when entrapment was the primary indication for surgery. Endoscopic repair became very difficult and often not possible when a large amount of soft tissue was herniated through the floor defect and when dissection medially onto the lamina papyracea and lateral to the infraorbital nerve was required for implant placement. Duration of follow-up was short for some patients, but no adverse trends in outcomes were identified.

Conclusions: Blowout fractures can be approached endoscopically. However, the technical challenge of working from below with a telescope tends to increase the difficulty of many repairs without improving results. Most blowout fractures are probably still best treated through an open approach, assuming that the lower eyelid incision is correctly performed.

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THE REPAIR OF FRACTURES OF the orbital floor through a Caldwell-Luc antrostomy is not a novel concept.1 The original technique required that the displaced floor fragments and orbital soft tissues be blindly reduced from below, using either an inflated catheter balloon or a fingertip. The repositioned structures were then supported by a balloon or gauze ribbon packing left in the antrum for 10 to 14 days. The transantral approach was represented as late as 1985 as the safest and most effective technique for repair of blowout fractures.2 However, the potential to damage the orbital contents and the difficulty in maintaining the floor in its correct position prompted most surgeons to abandon this technique in favor of an external approach.3,4

The external approach had the advantage of direct visualization of the floor fragments and protection of the herniated orbital tissues, allowing for safer and more accurate reconstruction of the floor with a graft or implant. These advantages were thought to outweigh the disadvantage of possible iatrogenic damage to the eyelid that could lead to eyelid retraction and increased scleral show, or even gross ektopion. Several articles5-8 describing large series of cases demonstrated a lower eyelid complication rate of up to 5% in patients who had undergone either subciliary or transconjunctival incisions for a variety of reasons. It was this reported eyelid complication rate that encouraged the development of endoscopic techniques for orbital floor fracture repair.

Authors9,10 started using the transantral approach as an adjunct to a direct eyelid or transconjunctival approach in cases in which entrapped soft tissues could not be readily freed from the fracture site from above. The addition of the endoscope provided a greatly enhanced screen image of the details of the floor injury and further refined the transantral or transnasal approach.11,12 In 1997, Saunders et al13 performed a cadaver and clinical study from which they concluded that transantral endoscopy improved posterior visualization. They argued that this evaluation could avoid unnecessary floor exploration in patients with equivocal examinations and computed tomography (CT). They also proposed that in select cases,
periorbital tissue from trapdoor fractures could be released endoscopically.

In a second cadaver study in 1998, Mohammad et al concluded that endoscopic assistance makes transantral placement of a semiflexible alloplastic material, such as Medpor (Porex, Newnan, Georgia), technically possible. Strong et al used the endoscope in 16 cadavers and 10 patients. They noted that the endoscope offered improved visualization and that it was technically possible to repair fractures endoscopically. In addition, the theoretical benefit of decreased eyelid complications made this approach intriguing and led the senior author (R.B.S.) to begin using the transantral endoscopic approach to dissect and repair fractures of the floor of the orbit. We describe our experience with 53 patients whose injuries were treated in this manner to illustrate the guidelines we have developed for patient selection. To our knowledge, this is the largest series of patients treated with this technique to be evaluated for outcomes.

**METHODS**

Patients with orbital floor fractures that did not involve the inferior orbital rim were considered candidates for transantral endoscopic orbital floor repair. An associated fracture of the medial orbital wall was not considered a contraindication unless the medial wall fragments were displaced into the ethmoid sinus. Repair of the fracture was recommended if 1 of the following was noted: (1) restriction of globe motility with diplopia and CT evidence of herniation of orbital contents through a fracture defect (no set observation period was required for the restriction to be considered an indication for surgery); (2) clinically obvious enophthalmos; or (3) findings on coronal CT scans, either direct or reformatted from fine-cut axial scans, that suggested fracture involvement of at least 2 cm² or 50% of the orbital floor with displacement of fragments and increased orbital volume. Consent was obtained for both the transantral approach and for an external approach through the lower eyelid in all patients. All procedures were performed with the intent to complete the entire procedure through the antrum. The intraoperative decision to convert to an external approach was based on the subjective sense that an attempt to complete the procedure through the antrum would place the orbital tissues at increased risk for an iatrogenic injury or that technical difficulties were excessively prolonging anesthetic time.

The surgical technique was as follows. All patients were stabilized in a neurosurgical head holder that was compatible with the Greenberg retractor system (Codman, Raynham, Massachusetts). The anterior wall of the maxillary antrum was exposed through an upper gingivolabial incision with the dissection carried up to the infraorbital foramen. An osteotome and Kerrison forceps were used to create a 1.5 × 1.5-cm antrostomy just below the foramen. A small keyhole notch was placed in either the medial or lateral edge of the antrostomy, depending on operator preference, to allow for placement and stabilization of either a 0° or 30° 4-mm telescope. A spatula was positioned to retract the lip and cheek tissues and to protect the infraorbital nerve. The sinus was cleared of blood and loose debris, and the orbital floor was inspected. In patients with a closed trapdoor type fracture, or with a single segment of floor angled downward but still hinged to the medial wall (open trapdoor), the mucosa was left attached to the bone except where it was immediately adjacent to the fracture lines to be reduced. In all other cases, the mucosa and all comminuted fragments were removed after the position of the infraorbital nerve, either in its intact canal or exposed in the fracture fragments, was confirmed. Closed trapdoor fractures were opened just enough to allow for release of entrapped orbital tissue and then reclosed. Hinged fragments were similarly closed and carefully “snapped into place” after the orbital contents were repositioned. Small defects (<1 cm²) created by fragment removal were repaired with Gelfilm (Pharmacia and Upjohn Co, Kalamazoo, Michigan) and larger defects with Medpor (0.4- or 0.85-mm thickness) (Porex), after a 2- to 3-mm orbital ledge had been dissected on at least 2 opposing sides of the defect. Larger implants were rolled to allow for insertion through the small antrostomy and then unfurled in the antrum for placement. Forced ductions were performed before and after the operative repair to verify that operative entrapment had not occurred. The sinus ostium was inspected for patency before closure of the gingivolabial incision. If it was judged to be not possible or not safe to complete the procedure through the antrum, the orbital floor was exposed through a transconjunctival incision, and the procedure was completed from above, usually combined with endoscopic visualization from below.

The 53 patients included 39 males and 14 females ranging in age from 10 to 84 years. Forty-one were younger than 40 years (77%), with these patients distributed almost evenly in the second, third, and fourth decades. Repair was undertaken for restriction of globe motility and diplopia in 17 patients, for the size of the defect and increased orbital volume in 18, and for a combination of these findings in 18 patients. Forty-five of the repairs (85%) were completed endoscopically; Medpor (Porex) was used in 28 patients (62.0%), nasal septal cartilage in 1 (2.2%, Gelfilm (Pharmacia and Upjohn Co) in 2 (4.4%), and Gelfilm to augment repositioned in situ bone in 4 (8.8%). Simple closure of a medially hinged trapdoor fragment was accomplished in the remaining 10 patients (22.2%). Eight procedures were aborted and converted to an open approach owing to the inability to successfully reduce and repair the orbital floor defect. Among the 8 patients whose procedure was aborted and converted to an open approach, 3 were being treated for restricted motility only. Each of these 3 patients had a triad of preoperative findings that included (1) a definite lock point, usually in up gaze, immediately after initiating the gaze movement; (2) a delay in treatment beyond 7 to 10 days from injury; and (3) a small defect, less than 1 cm² in size or trapdoor in nature, with herniation of an amount of periorbital tissue that seemed out of proportion to the size of the defect. Only 1 patient had actual herniation of the inferior rectus muscle through the defect. These patients seemed to have the equivalent of an incarcerated hernia, with an indurated mushroom of tissue that we felt could not be safely pushed through the floor defect from below even when the defect was surgically enlarged. In 2 of these cases, returning this tissue to the orbit was difficult even with intraorbital and transantral manipulation. The other 5 patients whose procedures were converted to an open approach had defects that met the size criteria for surgery. Four of these patients had fractures that extended from the medial orbital wall to the floor lateral to the infraorbital nerve. The fifth had a defect that did not extend beyond

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the nerve, but fibrosis related to a 60-day delay in treatment prevented reduction of the orbital soft tissues from the antrum.

Follow-up for all cases was to include a scheduled outpatient examination within the first week after surgery and with repeated visits as needed until a planned final examination 6 to 8 weeks after surgery. Patients were to be discharged from care if there were no ongoing problems noted at this final visit, with instructions to return at the first sign of any new concerns. Unfortunately, as is common in follow-up of patients who have undergone trauma, 14 patients treated endoscopically did not reach the 6- to 8-week milestone. The time points of the last follow-up for 45 patients are as follows: for 5 patients (11%) it was the day of discharge; for another 5 (11%) it was 4 to 7 days after surgery; for 4 (9%) it was 2 to 4 weeks after surgery; and for 31 (69%) it was more than 6 weeks after.

Outcomes at the last follow-up visit for 45 patients are as follows: 36 had no orbital complaints, 7 had postoperative diplopia that was improved from their preoperative examination, 3 had enophthalmos (1 patient had both diplopia and enophthalmos), 2 had sinusitis requiring surgery, and 8 had persistence of their preoperative infraorbital hypesthesia. None of the 5 patients last seen at the time of hospital discharge complained of persistent diplopia when examined prior to discharge, although 2 had definite restriction of globe movement preoperatively. Of the 5 patients who returned only for the first outpatient examination 4 to 7 days following surgery, 1 had persistent diplopia, although it was steadily improving by his subjective evaluation. Similarly, 2 of the 4 patients who were last seen 2 to 4 weeks after surgery had improved diplopia, although 1 of these 2 patients had persistent restriction of globe motility. However, his treatment had been delayed for 21 days from time of injury, and he was found to have tissue that included the inferior rectus muscle herniated through a closed trapdoor fracture.

Thirty-one of the patients treated endoscopically (69%) reached the desired minimum follow-up date of 6 weeks. Among 15 patients seen after 6 to 8 weeks, 12 had no problems and were discharged from care. One patient with a large blowout defect repaired with septal cartilage was found to have 1 mm of enophthalmos, unrecognized by the patient. He did not return for a subsequent scheduled visit. Two patients had persistent motility restriction and diplopia. One of these patients, whose surgery had been delayed 42 days from the time of injury, was pleased with the improvement from her preoperative status and declined further scheduled follow-up. The other patient’s surgery had been delayed 15 days and he was found to have a large mushroom of tissue herniated through a small posterior defect. Although intraoperative forced ductions were consistent with release of the entrapped tissue, his maximum voluntary up gaze position improved from 30° to just 45°. He was one of 2 patients in the series who expressed displeasure with their outcome and declined further follow-up at our facility. One patient at an 8-week follow-up required surgical treatment for postoperative ipsilateral maxillary sinusitis. The natural ostium of the sinus was opened by transnasal endoscopy, and the infection resolved.

Seven patients who had undergone endoscopy had their final visit delayed until 3 months after surgery, in most cases to allow time for complete resolution of subjective diplopia. Included was 1 patient who had experienced a postoperative ipsilateral maxillary sinus infection that cleared with antibiotics. He and 4 others in the group had no residual problems, 1 had persistent but still improving diplopia in extreme down gaze, and 1 had a 1-mm decrease in palpebral fissure height, unrecognized by the patient. This patient had undergone closure of a medically hinged open trapdoor fracture at the same time as repair of a complex frontal sinus injury. A CT scan obtained at this follow-up visit to evaluate the treated frontal sinus showed that the orbital floor had healed without evidence of previous fracture lines. However, the angle between the floor and medial orbital wall was less obtuse than on the uninjured side, giving the impression of unequal orbital volumes.

The remaining 9 patients who had undergone endoscopic surgery had a duration of follow-up ranging from 8 months to 2 years. Eight of these patients had returned at these late dates either for unrelated problems or in response to a request for follow-up photographs. Included in this group was the second patient in the overall series to have required a transnasal endoscopic antrostomy to treat a postoperative ipsilateral maxillary sinus infection. One other patient was being evaluated for a new closed head injury, and a CT scan revealed mucosal thickening consistent with asymptomatic chronic inflammation in the maxillary sinus. The final patient in this group returned 2 years after her injury to inquire about possible additional surgery to correct a slight asymmetry in palpebral fissure height and diplopia in extreme up gaze. She had been treated 4 days after injury for a closed trapdoor fracture that was opened widely and then reclosed after release of a large amount of soft tissue that did not include the inferior rectus muscle. At this visit, 2 to 3 mm of enophthalmos was measured, but there was no obvious restriction in up gaze. The medical record of findings at a known 3-week follow-up visit could not be located for comparison. The procedure to correct the enophthalmos was explained to the patient, and she decided against further evaluation and treatment.

All of the 8 patients whose procedures were converted to an open approach reached the minimum follow-up date. Two patients with no complaints at 6 weeks were discharged from care. Follow-up was extended to 3 months for 1 patient because of an ipsilateral maxillary sinusitis that required an endoscopic antrostomy and to 4 to 5 months for the others to evaluate persistent restriction of motility with diplopia. One of these patients had complete resolution of the diplopia at 4 months, but it was noted to have 1 mm of enophthalmos, which he had not recognized. Three of the remaining patients had resolution of the diplopia by 5 months, but the last patient had very bothersome diplopia owing to residual restriction of gaze in all fields, along with 3 to 4 mm of enophthalmos. He had been first examined at our institution 8 days after his injury and was found to have a frozen
globe with herniation of a very large mushroom of ischemic orbital fat and inferior rectus muscle through a 1-cm² defect. He was the second patient in the series who expressed displeasure with his result and declined further follow-up.

Three specific areas of concern for iatrogenic injuries related to the transantral approach were intraoral wound healing, implant migration or extrusion, and damage to the infraorbital nerve. None of the total group of 53 patients developed a chronic oroantral fistula, although 3 of the patients with postoperative maxillary sinus infections had persistent purulent drainage through the upper buccal incision until adequate sinus drainage was re-established with an antrostomy. Similarly, there were no recognized instances of displacement of implants that were inserted either from above or below. Eight patients complained of infraorbital hypesthesia at their last visit. Five of these patients had mild infraorbital hypesthesia at their 2- or 3-month follow-up that was improved compared with before surgery. Three patients, 1 with moderate hypesthesia and 2 with total anesthesia, reported no change after surgery. No patients complained of dysesthesias or postoperative worsening of a sensory deficit.

Endoscopic surgery has become synonymous with minimal access or minimally invasive surgery in many areas of the body. The understood goal of endoscopic surgery is to complete an operative procedure with less external morbidity, and thus greater patient acceptance, without compromising the internal result that can be obtained through a traditional open approach. Transnasal endoscopic surgery has been established as the accepted technique for inflammatory and some neoplastic diseases of the paranasal sinuses. It has also been shown to be an excellent approach in the hands of experienced endoscopic surgeons for orbital decompression in patients with Graves orbitopathy. It was, therefore, not unexpected that the natural optical cavity provided by the paranasal sinuses would entice surgeons to approach injuries of the orbital floor endoscopically.

The orbital floor can be visualized endoscopically either through the nose following enlargement of the maxillary ostium and partial ethmoidectomy, or through the anterior wall of the maxillary sinus following creation of a Caldwell-Luc antrostomy. Some authors have advocated a transnasal approach or use of a balloon reduction without an implant. The requirement of a sinonasal balloon for up to a week may minimize any potential advantage of a minimally invasive approach. Also, the failure to control the reduction could potentially result in suboptimal re-creation of the premorbid orbital floor contour. In our series of patients, we chose a transantral approach, with an attempt to restore the correct premorbid configuration of the floor with either stable in situ bone or an implant.

Our decision to repair an orbital floor fracture was based on each patient's presurgical clinical examination and coronal CT images. There were no cases in which repair was then deemed to be unnecessary based on the endoscopic findings. In most cases the amount of orbital contents herniated into the sinus when viewed on the video monitor actually appeared to be greater than what could be appreciated on the CT scan, supporting previous concerns that CT scans might not always accurately quantify injuries. We agree with Forrest that transantral endoscopic evaluation to determine the need to repair the floor may be of value following the reduction of displaced orbitozygomatic fractures. Movement of the zygoma to its preinjury anatomic position, particularly when the zygoma has been impacted, may alter the alignment and stability of floor fragments, or even enlarge a floor defect relative to what was appreciated on the preoperative CT scan. If not recognized and repaired, these intraoperative changes could create the potential for delayed enophthalmos.

Our results show that the transantral endoscopic approach does facilitate the repair of certain orbital floor fractures and yields results that seem comparable with those expected with a traditional open approach. The most obvious of these was release of periorbital tissue trapped in a hinged or small blowout defect. The enhanced screen image made identification and removal of offending bone fragments from below much easier than with direct visualization and headlight illumination from above, and no retraction of the globe was required. Typically, the tissue could be returned to the orbit with minimal pressure after all loose bone fragments were removed and then held in position by simply closing the hinged fragment or inserting a small, easy-to-position implant. Predictors of entrapped tissue that could not be reduced into the orbit from below were soft tissue herniation that seemed out of proportion to the size of the bony defect and a delay in treatment of more than 7 days. In the overall series, all patients with persistent diplopia when last seen, other than in an exaggerated up or down gaze position, had treatment delays of 15 or more days.

Repairs indicated by acute or predicted enophthalmos were not as readily accomplished owing to the larger size of the defects in the floor and the greater amount of orbital tissue that had herniated into the antrum. As the size of the defect increased, transantral identification and dissecting of ledges adequate to support an implant became more problematic. Ideally, an implant that will not be held in place with some form of fixation would be positioned to overlap bone around the entire circumference of the orbital surface of the defect. At a minimum, it must rest on 2 stable opposing ledges. The posterior ledge in many of our cases was so small or unstable that it could not be used as a rest point, making the medial and lateral ledges key sites for support of the implant. We found that positioning the implant on a medial ledge became very difficult if the margin of the fracture extended beyond the medial strut (Figure) of the orbital surface of the maxilla into the lamina papyracea of the ethmoid bone. Even if the very thin bone at this site was not initially displaced, it was comminuted and tended to fragment as the implant was being positioned. The medial margin of the implant would then fall into the ethmoid sinus under the pressure of the repositioned orbital tissues when the opposing lateral margin was pushed into place. This often necessitated repeated
attempts at placement of progressively wider implants until a stable position higher on the medial wall was reached. Because the dissection was extended up the medial wall, it became very difficult to simultaneously retract the orbital tissues and maneuver the implant.

The lateral margin of the defect often involved the course of the infraorbital nerve. If the thickened bone of the infraorbital groove was fractured and unstable, dissection of an adequate lateral ledge was hindered by the transition of the nerve from the groove posteriorly to a canal anteriorly. To create a lateral ledge of adequate width and length, removal of the nerve from the canal up to the orbital rim was required so that the implant could be placed either over or under the nerve without binding the nerve as it entered the rim. Obviously, this dissection placed the nerve at risk for further injury. If the lateral margin of a blowout defect extended more than 1 to 2 mm beyond the nerve, we were unable in most cases to create an adequate lateral ledge from below.

Removal of the displaced bone fragments from the larger defects allowed the orbital fat and inferior rectus muscle to bellow further into the antrum through the exposed, shredded periorbita. En bloc reduction of the entire mass of soft tissue into the orbit prior to implant insertion was usually not possible owing to the limitation in size of a retractor that could be inserted through the antrostomy. This necessitated using the implant itself to push much of the soft tissue back into the orbit, making its manipulation through the defect onto the small orbital surface ledges more difficult. Larger implants, particularly those used to repair defects that extended from the lamina papyracea to the floor lateral to the nerve, were by necessity thinner Medpor (Porex) that could be rolled, inserted through the antrostomy, and then unfurled in the antrum. Evaluation of the contour of these implants, if they could be maneuvered into position, was difficult on the 2-dimensional screen image if there was not a good posterior ledge of bone to define the level of the orbital floor in the retrobulbar area. The ones that appeared to sag and have a tenuous hold on the ledges were replaced with larger and thicker implants inserted through an eyelid incision. En bloc reduction of the entire mass of soft tissue into the orbit prior to implant insertion was noted in several patients was caused by a sagging implant that was not recognized and replaced. Longer follow-ups may have shown this problem to be even more common. Although we did not see it, less-stable implants may be at increased risk for collapse into the antrum in the early postoperative period.

The problems encountered during insertion of implants into the larger defects indicate to us that an endoscopic approach facilitates repair of the orbital floor only when intact, well-defined ledges of bone remain in the area of the medial strut and the medial edge of the infraorbital groove. Dissection of these ledges, return of soft tissues to the orbit, and insertion of stable implants can be accomplished with relative ease and minimal pressure on the globe with this type of defect. Working beyond these boundaries is possible, but the repair becomes much more difficult and time consuming and the results less predictable. Therefore, the number of cases that qualify for a strictly endoscopic approach is limited, and most can be accurately identified on close inspection of the preoperative CT scans. Transantral endoscopy may be helpful for visualization of the posterior floor to aid in bone removal and implant placement when defects extend beyond the boundaries but only in combination with a planned approach from above. Operative time in these cases should not be unnecessarily extended in an attempt to complete the procedure from below.

Other surgeons who have described endoscopic techniques that included placement of an implant into the floor defect to prevent posttraumatic enophthalmos have also used an anterior wall antrostomy. Ducic21 inserted Gelfilm (Pharmacia and Upjohn Co) from below into fractures with no dimension greater than 1 cm but felt that implants or grafts for larger defects required an approach through the eyelid. Chen and Chen22 reported excellent results with the transantral placement of Medpor (Porex) into large defects with stable bony edges in 3 patients. They used titanium micromesh anchored to the antral side of the floor with 4-mm microscrews in 6 patients with defects that had insufficient edges to support Medpor. The micromesh seems to have been used
in patients in whom we would have used a combined approach. Chen and Chen\textsuperscript{22} also suggested that a medial transconjunctival endoscopic approach could be added to reach the medial wall in cases in which an extension of the defect up the lamina papyracea was encountered. During follow-up that ranged in duration from 4 to 20 months, they observed no complications other than transient anesthesia in the distribution of the infraorbital nerve. Persons and Wong\textsuperscript{23} subsequently described excellent results in 5 patients after implanting a sheet of resorbable bone plating material (Lactosorb; W. Lorenz, Jacksonville, Florida) into floor defects from below, again using screw fixation of the material to the undersurface of the floor if stable ledges were not available for support. The duration of follow-up in this group ranged from 3 to 12 months. Both of these series offer appealing, although to us somewhat extreme, alternatives to converting an endoscopic case to an open case. The surgeon must be willing to accept the risks that come with drilling holes and inserting screws into the orbit in a location that is technically difficult to access and with suspending implants from the thin bone of the roof of the sinus. The addition of a second endoscopic approach may overcome deficiencies of the first, but it will add to the complexity of the procedure and further lengthen operative time.

As mentioned in the introductory section of this article, the primary motivation for developing the endoscopic technique is to reduce the risk of eyelid injuries from the incision and postoperative scarring. However, several studies\textsuperscript{12-15} have concluded that transconjunctival incisions produced fewer permanent eyelid changes than subciliary incisions. Among patients being treated for fractures of the orbit, serious complications, such as ecctropion, were seen only when the transconjunctival incision was performed in combination with extensive soft tissue undermining over the orbital rim to allow for reduction and fixation of orbital fractures. Minor eyelid changes related to the use of this incision to expose injuries limited to the orbital floor were relatively rare and included mild entropion, increased scleral show of less than 1 mm, and notching of the eyelid margin if a lateral canthotomy was used. All of these changes were either undetectable to the patient or easily corrected. Thus, a properly performed transconjunctival approach to the orbital floor should have a very low risk of meaningful eyelid complications. All patients included in our study had pure orbital floor fractures or additional fractures that did not require extensive dissection over the inferior orbital rim. Dissecting over the rim increases the risk of eyelid complications and therefore makes the endoscopic approach more appealing. However, orbital rim fractures that require fixation would necessitate the eyelid incision and thus provide access for an open approach to the floor.

The transantral endoscopic approach can facilitate repair of orbital floor fractures in properly selected patients. Our initial impression is that it is of definite value in (1) patients with diplopia caused by entrapment of periorbital tissue in small fractures. The ease and safety with which it can be used in these cases may justify early intervention in hopes of preventing permanent injury to the periorbital tissue rather than using a period of observation to confirm the entrapment. (2) It may also be of value for smaller floor defects that still qualify for repair based on size criteria, but only if the defect is confined within the distinct boundaries of the medial orbital floor. (3) It may be useful in combination with an open approach if the surgeon has difficulty establishing the posterior ledge. The surgeon must always keep in mind that the ability to approach the floor without making an eyelid incision does not lessen the error of a surgical procedure undertaken for questionable indications. A transantral approach requires a relatively large intraoral incision, elevation of the cheek tissues from the face of the maxilla, and creation of a hole in the anterior wall of the maxillary sinus. It is, therefore, not minimally invasive in terms of patient discomfort and length of the healing process when compared with a properly performed transconjunctival incision. More important, manipulation of the orbital tissues based on a screen image can prove difficult for anyone not experienced in endoscopic surgical techniques, particularly if a 30° rather than a 0° endoscope is being used. A small error in the depth or angulation of an instrument, particularly during grasping of bone fragments or placement of an implant, could lead to a permanent injury of the inferior rectus muscle or even blindness. Although transantral endoscopic repair of blowout fractures may have indications as described herein, it is our opinion that it should not be undertaken without a clear understanding of its limitations and should not be the surgeon’s first choice of the endoscope in the periorbital area.

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