Orbital “Blowout” Fractures: Time for a New Paradigm

Robert C. Kersten, MD - San Francisco, California
M. Reza Vagefi, MD - San Francisco, California
George B. Bartley, MD - Rochester, Minnesota

With the exception of pediatric trapdoor floor fractures (the so-called white-eyed blowout), which warrant immediate repair to prevent sequelae of oculocardiac reflex and muscle fibrosis,1–2 the optimal management of so-called routine orbital blowout fractures remains controversial. Two issues lie at the heart of the debate: the indications for repair and the timing of repair. Unfortunately, there are no prospective, randomized clinical trials to guide decision making.

More than 15 years ago, Burnstine4 assessed the published literature, seeking to define the indications and timing of repair for orbital blowout fractures. The study reviewed relevant articles from 1983 to 2000, 31 of which were selected to develop guidelines. All studies were noncomparative, retrospective reports or case series, but the criteria derived from them have been the standard of care since that time. Burnstine advocated urgent repair for trapdoor fractures with entrapment of an extraocular muscle by the fracture fragment and marked restrictions of vertical gaze, significant nausea and vomiting, or bradycardia resulting from the oculocardiac reflex. He proposed observing all other orbital fractures for 2 weeks before repair. Such fractures can be categorized into 3 groups: (1) those associated with symptomatic diplopia and positive forced ductions, computed tomographic evidence of entrapped perimuscular soft tissue, and minimal clinical improvement; (2) fractures associated with significant hypo-ophthalmos or enophthalmos; and (3) large floor fractures (more than one half of the orbital floor displaced more than 5 mm).

Not included in the analysis were seminal studies from the 1970s by Emery et al5 and Putterman et al6 of orbital blowout fractures that demonstrated no significant difference between surgical and nonsurgical groups in the frequency of clinically significant enophthalmos or symptomatic diplopia when patients were observed for a prolonged interval without surgical repair. Our understanding of the natural history of orbital fractures and the success of delayed surgical intervention has improved over the past decade. As mentioned previously, although most surgeons agree on the need for urgent repair of pediatric trapdoor fractures with an entrapped extraocular muscle, it has been well established that good results can be obtained when operating on fractures with persistent diplopia or enophthalmos, even when surgery is delayed well beyond the 2-week window.7–13 The recommendation for operating within 2 weeks was based on the putative belief that surgery would be more difficult and less successful if delayed.14 Notably, this 14-day window has been questioned because it is too long of a delay for repair of a tightly entrapped muscle, but too soon to allow for the usual spontaneous resolution of diplopia that typically occurs in fractures other than the trapdoor variety. The formative study by Putterman et al6 regarding the natural history of unoperated blowout fractures found that diplopia resolved in all patients within 6 months. Similarly, Kasaei et al15 found in 72 patients with blowout fractures followed up without surgery that diplopia resolved in all but 1 patient (1.4%) by 6 months after injury. In a more recent prospective study by Nishida et al,16 diplopia resolved in all unoperated patients by an average of 7 weeks after injury, with a range of 19 to 143 days.

Multiple authors have found that late enophthalmos is rare, even in the case of large fractures. However, it is difficult to predict from imaging studies in which patients it will develop.17–19 The study by Young et al20 (http://www.aaojournal.org/article/S0161-6420(17)33330-4/fulltext) in this issue provides additional insight to the ultimate outcome of such patients. They observed that the size of an unoperated fracture on imaging often decreases over time as the initial traumatic edema resorbs and bone remodels. Silverman et al14 recently presented a prospective multicenter trial in which large fractures were observed for up to 6 months after injury. Of 46 patients enrolled, 37 patients did not demonstrate enophthalmos of 2 mm or more. Of the 9 patients who did demonstrate “significant” enophthalmos, only 50% were sufficiently concerned with their appearance to choose delayed surgical repair. In those patients who opted for eventual surgical repair, there was no difference in outcomes between those having surgery within 2 weeks’ time and those who underwent surgery at a later time.

How about patients with persistent double vision? Although some studies have found that delayed operation may have a lower chance of curing symptomatic diplopia,14,22,23 other studies from several surgical disciplines have found similar rates of resolution of double vision in early versus delayed intervention.7–13 All of these studies are retrospective and confounded by the inclusion of 2 groups of patients: (1) patients with trapdoor fractures that may not present immediately after injury and thus will bias the seemingly delayed surgical outcomes and (2) patients...
who underwent routine early surgery whose diplopia would have cleared with observation over time.

Further insight into the outcomes of these 2 groups of patients was provided by Biegi et al. in their series of 79 orbital fractures. Although they advocated for early repair of all fractures with documented extraocular muscle entrapment, 2 of their patients sought treatment on a delayed basis and both experienced persistent diplopia after surgical repair. They chose to observe all fractures with diplopia and tissue incarceration at presentation, but no frank extraocular muscle entrapment, for 6 to 8 weeks before deciding whether repair was necessary. They found that, in most fractures with tissue incarceration but no frank trapdoor entrapment, initial diplopia cleared spontaneously (24 of 42 patients). Importantly, in the 17 patients with persistent diplopia after the period of observation, all were successfully operated 4 to 5 months after injury with resolution of diplopia in all fields except extreme upgaze.

With these observations in mind, we believe it is time to abandon the old paradigm of performing surgical repair of large fractures or those associated with persistent diplopia within 2 weeks of injury. It has been our practice for many years to follow the protocol advocated by others. We propose dividing patients into 2 groups: those (usually children) with trapdoor fractures and marked vertical limitation of ductions, and all others. Patients with trapdoor fractures and marked limitation of vertical gaze are taken to surgery as soon as practicable. In such cases, surgical repair is inevitable, and delaying the operation risks greater morbidity and less satisfactory postoperative outcomes. In the remainder of patients (the large majority), we advocate more prolonged observation to allow resolution of diplopia or development of cosmetically significant enophthalmos. In those patients with diplopia, but without frank muscle entrapment, we are able to reassure them that the diplopia typically resolves without surgical intervention, but that should it persist, delayed surgery is still likely to achieve full restoration of functional motility. Patients with large fractures also can be reassured that the development of late enophthalmos is uncommon, but that should it occur, subsequent repair can be pursued with no increased risk of surgical complications.

**References**

Footnotes and Financial Disclosures

Financial Disclosure(s): The author(s) have no proprietary or commercial interest in any materials discussed in this article.

Supported in part by unrestricted grants to the authors’ institutions.

Correspondence:
Robert C. Kersten, MD, Division of Oculofacial Plastic Surgery, Department of Ophthalmology, University of California, San Francisco, 10 Koret Way, Room 301, San Francisco, CA 94143. E-mail: Robert.Kersten@ucsf.edu.