

Surgical Management of the Traumatic Cataract

Proper surgical care of challenging cases can salvage good vision and anatomic results.

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A traumatic cataract may develop after various types of ocular insult, including blunt or perforating trauma as well as ionizing, infrared, or ultraviolet radiation.¹ Besides cataract, ocular trauma can also induce lens subluxation and dislocation, and cause injuries to the cornea, iris, vitreous, and retina.

In the case of blunt trauma, coup and contrecoup forces on the lens could cause rapid anterior-posterior shortening, leading to abrasion or rupture of the lens capsule with subsequent cataractogenesis. Direct anterior-posterior force also produces equatorial expansion of the lens, which can result in equatorial capsular rupture and zonular dehiscence. Equatorial capsular rupture can further stimulate cataract formation, although zonular dehiscence can lead to lens subluxation or complete dislocation, depending on the extent of zonular incompetence.^{2,3} Blunt ocular trauma typically leads to a stellate or rosette-shaped opacification that is axial in location and involves the posterior capsule.¹

In perforating trauma, direct compromise of the lens capsule by the penetrating object leads to cortical opacification at the site of injury. If the capsular tear is large enough, the entire lens can rapidly opacify, but a cataract caused by a small perforation may become sealed off and remain localized.⁴ Contusive forces, as described for blunt trauma, may or may not be present, depending on the agent and mechanism responsible for injury, but they will exacerbate cataract formation if present.

PREOPERATIVE ASSESSMENT

Before performing surgery to manage a traumatic cataract, a detailed preoperative examination is required to identify other pathology that may prevent optimal postoperative visual recovery and to help with the decision of which surgical approach to take. Open-globe injuries and intraocular foreign bodies must be ruled out before surgery.^{5,6} Additionally, it is possible that following an episode of intraocular inflammation, a fibrin layer covering the anterior

surface of a clear lens may masquerade as cataract. Careful visualization of the exact location of the lens opacification (anterior to or within the lens itself) is important to rule this condition out, thereby preventing unnecessary surgery. This can be difficult, especially with children of whom slit-lamp examination is difficult to perform.^{1,7}

Abnormal findings that predict a poor postoperative visual outcome include corneal disease, iridodialysis, a relative afferent pupillary defect, macular scarring, retinal detachment, and optic atrophy.⁸ Greven et al⁸ found that only 30% of eyes that suffered from contusion injuries had normal preoperative posterior segments; thus, a B-scan is necessary if the posterior pole cannot be visualized. The physician should also examine patients for intraocular inflammation and increased IOP preoperatively and provide appropriate treatment.

In carrying out a thorough lenticular examination, the physician should first determine the type (nuclear, cortical, subcapsular, etc.), location, and degree of lens opacification. Furthermore, a careful assessment for zonular disruption and associated lens subluxation or dislocation is important in deciding which surgical approach to take. Maximal phar-

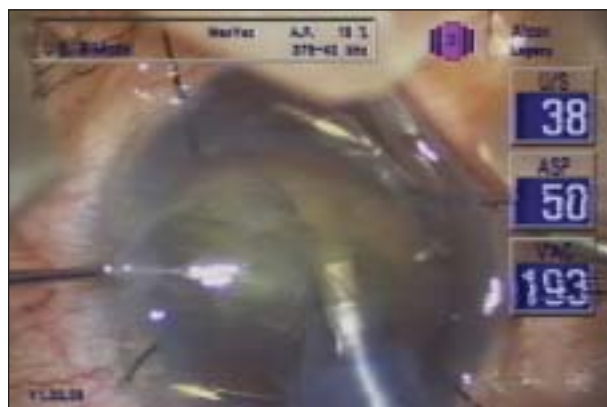


Figure 1. Iris retractors placed at the capsulorhexis' edge can act as artificial zonules during intraoperative maneuvers.



Figure 2. The Cionni-modified CTR can be sutured to the sclera. The CTS, with its 90° arc, can be inserted at a specific site of zonular weakness (inset).

macologic pupillary dilation may be necessary to identify a subtle zonular dialysis. At the slit lamp, the physician should note the degree of zonular dialysis and phacodonesis, as well as the resting position of the lens. Iridodonesis may be the initial clinical sign indicating zonular dehiscence.¹ An anteriorly displaced lens may present with a shallow anterior chamber and requires immediate removal due to the risk of pupillary block.⁹ A posteriorly subluxated lens may only be clinically evident during an examination of the patient with a portable slit lamp while he is in a supine position.⁷ If available, ultrasound biomicroscopy can be helpful for assessing capsular and zonular integrity.

SURGICAL CONSIDERATIONS

Depending on the clinical situation, the surgical management of a traumatic cataract is performed using either a standard anterior limbal or posterior pars plana approach. An anterior approach is best for a traumatic cataract unless there is complete lens dislocation or capsular rupture with significant lens material incarcerated in the vitreous. The surgeon should perform a standard phacoemulsification cataract extraction using a large capsulorhexis and initiated at the site of greatest zonular stability.⁷ Capsular staining with trypan blue in cases of poor visualization (not FDA approved)¹⁰ and generous hydrodissection to avoid stress on the zonules during lens extraction are also important steps.⁷ A low-flow,

low-vacuum, supracapsular phaco technique is preferred to minimize capsular and zonular stress. If zonular dehiscence and subsequent vitreous prolapse occur intraoperatively, a cutting-aspiration handpiece can be used to remove the vitreous.⁷ Subsequent operative steps will depend on the degree of zonular disruption, which will be discussed later.

The posterior approach with vitrectomy and lensectomy is reserved for cases of posterior capsular rupture with vitreous prolapse or a posteriorly dislocated lens.⁷

The degree of zonular dehiscence dictates the management approach for a subluxed or displaced lens. If the dehiscence is small with no vitreous prolapse, extra care should be taken not to stress the zonules; otherwise, routine surgery is appropriate. For a larger zonular disruption, the surgeon should consider the implantation of a capsular tension ring (CTR). For zonular dialysis of up to 150°, the use of a conventional CTR followed by standard phacoemulsification and PCIOL insertion has been highly successful.¹¹

The CTR is an open ring made of a single piece of PMMA that is placed inside the capsular bag. The CTR reforms the posterior capsule, and produces a taut capsular equator that protects against aspiration of the capsular fornix, thereby preventing extension of the zonular dialysis during surgical manipulation. It also allows for easier IOL placement, prevents later IOL decentration, and reduces the postoperative incidence of posterior capsular opacification.¹¹⁻¹⁴

In the case of surgery to remove a traumatic cataract, the CTR may be implanted before or after phacoemulsification.¹¹ Although early insertion provides support during phacoemulsification, it may create additional zonular trauma.¹⁵ The use of iris or capsule retractors at the capsulorhexis' edge (Figure 1) or the use of a capsular tension segment (CTS; Morcher GmbH, Stuttgart, Germany [not currently approved by the FDA]) during phacoemulsification are other alternatives that do not induce significant capsular

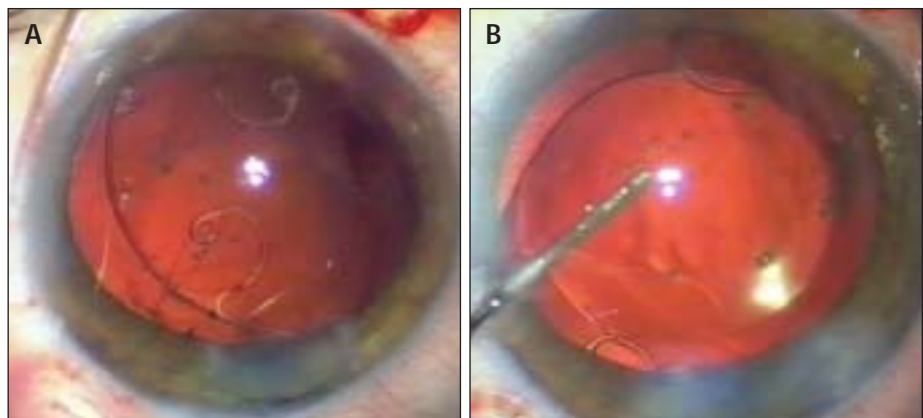


Figure 3. Two CTS devices have been placed in the capsular bag for profound generalized zonular compromise (A). Once sutures have been threaded through the eyelets, a PCIOL can be placed within capsular bag with optimal centration (B).

torque during insertion. The CTS (Figure 2) is a partial PMMA ring segment containing an anteriorly offset eyelet through which an iris retractor or suture may be placed.¹⁵

For more significant or progressive zonular dialysis, the Cionni-modified CTR (Morcher GmbH) has been demonstrated to be a useful alternative to the conventional CTR (Figure 2). It can be sutured safely to the sclera without compromising the capsular bag, thus allowing the CTR and capsule to be held in place even in the presence of significant zonular incompetence.^{16,17} Alternatively, one or two CTS devices may be used and may also be placed in cases of an anterior capsular tear, incomplete capsulorhexis, or posterior capsular rupture (Figure 3).

The use of aniridia implant devices such as iris diaphragm rings and iris sector shields is often appropriate in cases of a significant loss of iris tissue. These devices are not FDA approved. Pupilloplasty and/or repair of iridodialysis may also be required.

The choice and positioning of the IOL depends on the degree and location of zonular disruption. In eyes with no zonular disruption and an intact posterior capsule, a standard capsular bag-fixated IOL may be used. With a small area of zonular incompetence, a capsular bag IOL may also be used, but the haptics should be oriented toward the area of incompetence in order to expand and stabilize the capsular bag fully. With more significant zonular disruption, IOL implantation should be combined with CTR or CTS use. In cases of an unsalvageable capsular bag, other IOL options include ciliary sulcus-fixated IOLs, transsclerally sutured PCIOLs, and ACIOLs.⁷

Although the ACIOL has been advocated in special circumstances (elderly patient, good iris support, no evidence of glaucoma, no vitreous in anterior chamber), they should not be used in younger patients because of the increased risk of corneal endothelial injury and glaucoma from further angle injury.⁷ Using ciliary sulcus-fixated IOLs in children following traumatic cataract removal resulted in visual outcomes similar to those for capsular bag IOLs but with more complications, in particular uveitis and pupillary capture.¹⁸ Sclerally sutured PCIOLs were not compared directly with capsular bag IOLs but produced good postoperative visual results.¹⁹ The use of multifocal capsular bag IOLs following removal of a traumatic cataract has also been explored. In comparison with standard, monofocal, capsular bag IOLs, the multifocal lenses resulted in improved uncorrected near visual acuity and stereopsis, as well as decreased spectacle dependency.²⁰

CONCLUSION

In summary, a traumatic cataract is common after any form of injury to the eye. A thorough preoperative

ocular examination is essential to properly assess the eye with a traumatic cataract. The surgical approach, potential use of capsular tension devices, and choice of IOL are all dictated by the inherent integrity of the zonules, lens capsule, and other associated anterior segment structures. Excluding other intrinsic causes of visual dysfunction, an eye with a traumatic cataract is amenable to treatment and has an excellent potential for significant postoperative visual improvement. ■

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