

Controversies in Pediatric Eye Trauma: An Evidence-Based Topic Debate and Discussion

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Note to attendee: Thank you for attending the Eye Trauma workshop. We hope the debate will generate spirited discussion where the art of medicine may come into play. We have scheduled discussion time for every topic, and we invite you to participate by asking questions and challenging our panelists. Below, we collated some arguments for each view point as a quick reference for your next on-call trauma case associated with a controversial decision. Some panelists provided their thoughts ahead of time; other panelists felt that you should pull relevant information to you from their talks. Enjoy!

Topic 1: Systemic antibiotics after open-globe injury

	1 dose	Multiple doses	References
Top 3 reasons "I am right!"	Studies investigating systemic antibiotic use in open-globe injury are limited, particularly in children.	Effective: lowest published rates of endophthalmitis.	<p>Andreoli CV, Andreoli JH, Kober CE, Anderson AE, Vavvas D, Durand ML. Low rate of endophthalmitis in a large series of open globe injuries. <i>Am J Ophthalmol.</i> 2009 Apr;147(4):601-608.e2. doi: 10.1016/j.ajo.2008.10.023. Epub 2009 Feb 1. PMID: 19181306.</p> <p>Bhagat N, Nagori S, Zarbin M. Post-traumatic Infectious Endophthalmitis. <i>Surv Ophthalmol.</i> 2011 May-Jun;56(3):214-51. doi: 10.1016/j.survophthal.2010.09.002. Epub 2011 Mar 12. PMID: 21397289.</p> <p>Ahmed Y, Schimel AM, Pathengay A, Colyer MH, Flynn HW Jr. Endophthalmitis following open-globe injuries. <i>Eye (Lond).</i> 2012 Feb;26(2):212-7. doi: 10.1038/eye.2011.313. Epub 2011 Dec 2. PMID: 22134598; PMCID: PMC3272210.</p>
	Although many providers agree that a systemic antibiotic may be considered for a child with an open-globe injury at presentation, there are little to no data to support ongoing systemic antibiotics.	Scientifically based: supported by laboratory-based and retrospective clinical studies.	<p>Li X, Zarbin MA, Bhagat N. Pediatric open globe injury: A review of the literature. <i>J Emerg Trauma Shock.</i> 2015 Oct-Dec;8(4):216-23. doi: 10.4103/0974-2700.166663. PMID: 26604528; PMCID: PMC4626939.</p> <p>Miller SC, Flitsos MJ, Justin GA, Yonekawa Y, Chen A, Hoskin AK, Blanch RJ, Cavuoto K, Meeralakshmi P, Low R, Gardiner M, Liu TYA, Agrawal R, Woreta FA; International Globe and Adnexal Trauma Epidemiology Study (IGATES). Global Current Practice Patterns for the Management of Open Globe Injuries. <i>Am J Ophthalmol.</i> 2022 Feb;234:259-273. doi: 10.1016/j.ajo.2021.08.003. Epub 2021 Aug 18. PMID: 34416182.</p>
	Consider the potential long-term sequelae of systemic antibiotics in children when deciding the type and duration of treatment.	Easy to implement: variety of published IV and PO regimens.	<p>Weinert MC, Armstrong GW. Infectious Disease Prevention and Management in Traumatic Open Globe Injuries. <i>Int Ophthalmol Clin.</i> 2022 Apr 1;62(2):19-40. doi: 10.1097/IIO.0000000000000406. PMID: 35325908.</p> <p>Zhou Y, DiScialfani M, Jeang L, Shah AA. Open Globe Injuries: Review of Evaluation, Management, and Surgical Pearls. <i>Clin Ophthalmol.</i> 2022 Aug 10;16:2545-2559. doi: 10.2147/OPTH.S372011. PMID: 35983163; PMCID: PMC9379121</p>

Topic 2: Traumatic cataract extraction after open-globe injury

	Extraction within <2 weeks	Wait for the eye to stabilize	References
Top 3 reasons "I am right!"	Early removal clears the visual axis sooner and allows monitoring for secondary retinal pathology	Area for notes	Wang NK, Chen YP, Yeung L, Chen KJ, Chao AN, Kuo YH, Lee JS, Lai CC. Traumatic pediatric retinal detachment following open globe injury. <i>Ophthalmologica</i> . 2007;221(4):255-63. doi: 10.1159/000101928. PMID: 17579292.
	Early removal promotes earlier visual input and counters amblyopia	Area for notes	Zhu AY, Kraus CL. Practice Patterns in the Surgical Management of Pediatric Traumatic Cataracts. <i>J Pediatr Ophthalmol Strabismus</i> . 2020 May 1;57(3):190-198. doi: 10.3928/01913913-20200304-01. PMID: 32453853.
	Early removal promotes earlier visual input and allows earlier potential for binocularity	Area for notes	Junn S, Pharr C, Chen V, Williams K, Alexander J, Park HJ, Kraus C, Levin MR. Sensorimotor Outcomes in Pediatric Patients With Ocular Trauma in Baltimore. <i>J Pediatr Ophthalmol Strabismus</i> . 2022 Sep-Oct;59(5):303-309. doi: 10.3928/01913913-20220126-01. Epub 2022 Feb 22. PMID: 35192378.

Topic 3: Surveillance of hyphema associated with closed-globe injury

	Daily after diagnosis	Less frequent after diagnosis	References
Top 3 reasons "I am right!"	Area for notes	Acute surveillance after hyphema focuses on diagnosing and treating ocular hypertension (OHT). However, 84% have no evidence of OHT by 7 days after injury.	Girkin CA, McGwin G Jr, Long C, Morris R, Kuhn F. Glaucoma after ocular contusion: a cohort study of the United States Eye Injury Registry. <i>J Glaucoma</i> . 2005 Dec;14(6):470-3. doi: 10.1097/01.jgg.0000185437.92803.d7. PMID: 16276279.
	Area for notes	Daily visits are expensive to the healthcare system and carry significant opportunity cost for the patient, parent, and system.	Bowe T, Serina A, Armstrong M, Welcher JE, Adebona O, Gore C, Staffa SJ, Zurakowski D, Shah AS. Timing of Ocular Hypertension After Pediatric Closed-Globe Traumatic Hyphema: Implications for Surveillance. <i>Am J Ophthalmol</i> . 2022 Jan;233:135-143. doi: 10.1016/j.ajo.2021.04.033. Epub 2021 May 13. PMID: 33991515.
	Area for notes	Careful examination at outset will identify risk factors for those FEW patients who need daily surveillance.	

Topic 4: Vitreous hemorrhage after trauma

	Vitreotomy within 4 weeks	Observation	References
Top 3 reasons "I am right!"	Early vitrectomy is important to be able to visualize the extent of the intraocular damage early and be able to plan for futures procedures and treatments.	Most devastating pediatric retina sequelae that accompany vitreous hemorrhages, such as retinal tears or detachments, occur much later after initial trauma	<p>Spirn MJ, Lynn MJ, Hubbard GB 3rd. Vitreous hemorrhage in children. <i>Ophthalmology</i>. 2006 May;113(5):848-52. doi: 10.1016/j.ophtha.2005.12.027. PMID: 16650682.</p> <p>Sandinha MT, Newman W, Wong D, Stappeler T. Outcomes of delayed vitrectomy in open-globe injuries in young patients. <i>Retina</i>. 2011 Sep;31(8):1541-4. doi: 10.1097/IAE.0b013e31820840ef. PMID: 21358459.</p>
	Vitreotomy can help remove the posterior hyaloid, treat possible tears or holes early to avoid loss of vision.	Early surgical intervention with pediatric vitrectomies are high risk as they can be associated with higher rates of proliferative vitreoretinopathy, need for multiple surgeries, and cataract formation - all of which can contribute to amblyopia	<p>Leshno A, Alhalel A, Fogel-Levin M, Zloto O, Moisseiev J, Vidne-Hay O. Pediatric retinal damage due to soccer-ball-related injury: Results from the last decade. <i>Eur J Ophthalmol</i>. 2021 Jan;31(1):240-244. doi: 10.1177/1120672119882332. Epub 2019 Oct 15. PMID: 31612724.</p> <p>Liu X, Wang L, Yang F, Xie J, Zhao J, Liu Z, Su G, Yang L. Surgical management and outcomes of pediatric open globe injuries requiring vitrectomy. <i>Eur J Ophthalmol</i>. 2022 Jan;32(1):546-552. doi: 10.1177/11206721211000648. Epub 2021 Mar 11. PMID: 33706579.</p>
	The most important argument for vitrectomy is to AVOID proliferative vitreoretinopathy as once this develops the visual prognosis and capacity to reattach a retina decreases significantly in the pediatric population with permanent loss of vision.	Most non-penetrating trauma-related vitreous hemorrhage may clear spontaneously, which allows for less invasive, safer interventions, such as laser or scleral buckling for devastating sequelae	<p>Starr MR, Boucher N, Sharma C, Wakabayashi T, Sivalingam M, Klufas MA, Spirn M, Yonekawa Y. The State of Pediatric Retinal Detachment Surgery in the United States: a Nationwide Aggregated Health Record Analysis. <i>Retina</i>. 2023 Jan 10. doi: 10.1097/IAE.0000000000003735. Epub ahead of print. PMID: 36728195.</p> <p>Cohen S, Shiuey EJ, Zur D, Rachmiel R, Kurtz S, Mezd-Koursh D, Waisbourd M. Ocular injury from foam dart (Nerf) blasters: a case series. <i>Eur J Pediatr</i>. 2022 Dec 28. doi: 10.1007/s00431-022-04782-4. Epub ahead of print. PMID: 36575309.</p>

Topic 5: Traumatic muscle laceration

	Proximal-distal anastomosis	Scleral fixation of proximal muscle	References
Top 3 reasons "I am right!"	Area for notes	Unable to find the distal and proximal ends of transected muscle, a "lost" muscle	Burke MJ, Del Monte M, DeRespinis P. Medial rectus muscle laceration. J Pediatr Ophthalmol Strabismus. 2001 Mar-Apr;38(2):98-102. doi: 10.3928/0191-3913-20010301-11. PMID: 11310714.
	Area for notes	Posteriorly transected muscle or concern of nerve injury	Cherfan CG, Traboulsi EI. Slipped, severed, torn and lost extraocular muscles. Can J Ophthalmol. 2011 Dec;46(6):501-9. doi: 10.1016/j.jcjo.2011.09.023. PMID: 22153637.
	Area for notes	Adjustable suture to titrate tension and/or perform an intra-operative force generation test is possible	Plager DA, Parks MM. Recognition and repair of the "lost" rectus muscle. A report of 25 cases. Ophthalmology. 1990 Jan;97(1):131-6; discussion 136-7. doi: 10.1016/s0161-6420(90)32636-2. PMID: 2314834.