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CATARACT (CE STARR AND A BRISSETTE, SECTION EDITORS)

Update on Pediatric Cataract Surgery and the Delphi Panel Paper

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Abstract

Purpose of Review We review the Delphi panel paper and address topics of non-consensus in the preoperative, intraoperative, and postoperative management of pediatric cataract.

Recent Findings The Infant Aphakia Treatment Study expanded our understanding of unilateral cataract surgery in infants 6 months and younger. While primary IOL implantation is accepted for children older than 2 years, long-term data is required to determine the optimal age for primary IOL. Primary management of the posterior capsule should consider the child's unique risks and benefits. Recent benchmarking papers confirmed higher refractive prediction error than adults and there is a need for IOL calculation formulas that cater to the pediatric eye. The impact of next-generation sequencing, bag-in-the-lens, optic capture, and femtosecond laser are yet to be determined.

Summary Pediatric cataract management is challenging and questions remain on the best approach to some surgical aspects. Future long-term randomized trials will help us move toward consensus globally.

Keywords Pediatric cataract surgery · Delphi process · Practice patterns · IOL implantation · IOL power calculation · Primary posterior capsulotomy

Introduction

Pediatric cataract surgery has experienced exciting advances over the past decade. The 5-year results of the Infant Aphakia Treatment Study (IATS), a multicenter randomized trial comparing aphakic contact lenses (CL) to primary intraocular lens (IOL) implantation for infants 1 to 6 months of age with unilateral congenital cataract [1, 2••, 3••, 4–6], now serves as a benchmark for robust, high-quality empiric evidence in pediatric ophthalmology. Yet, certain aspects of the management of pediatric cataract have not been studied through randomization and lack long-term data from which to formulate strong recommendations.

Recently, Serafino et al. applied a modified Delphi process to highlight the current topics of consensus in pediatric cataract management [7••]. A group of international experts completed a series of questionnaires and attended an in-person meeting to facilitate group consensus on areas of disagreement. Subsequently, five key areas for future research were identified from the 21.3% of non-consensus questions [7••]. In this paper, we review the outcomes of the Delphi panel and recent literature relevant to areas of agreement and non-consensus in the preoperative, intraoperative, and postoperative management of pediatric cataract.

Preoperative Considerations

Evaluation and Investigations

The diagnosis of bilateral congenital cataract should prompt the clinician to review relevant exposures during pregnancy, birth, developmental and family history, and systemic features. Although experts agree that pediatricians and geneticists play a critical role in the child's care when systemic features are identified, they disagree on whether the ophthalmologist should order investigations if no systemic findings are present [7••].

Recently, the concept of using next-generation sequencing (NGS, a novel technology that enables rapid parallel DNA

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sequencing) to analyze over 100 genes associated with bilateral congenital cataract was assessed through quality improvement techniques [8, 9]. In a study of 27 patients diagnosed before age 12, NGS was associated with improved time to diagnosis and diagnostic yield (60 versus 8% for standard investigations) [10•]. While these results are powerful, NGS is not universally available. For bilateral cataract, we routinely order TORCH screen (for congenital infections associated with toxoplasmosis, other infections such as syphilis, varicella-zoster and parvovirus B19, Rubella, cytomegalovirus, and herpes simplex virus), urinalysis, blood work and karyotype, as well as examine family members, and then refer to Medical Genetics for further assessment of positive results or systemic features.

Timing of Surgery and IOL Implantation

Timing of surgery aims to reduce the risk of deprivation amblyopia associated with visually significant congenital cataract while minimizing the risk of postoperative glaucoma. The well-accepted conventional timing of surgical intervention is age 4 to 6 weeks for unilateral and prior to 8 weeks in bilateral cases [7••, 11–13]. However, the choice of refractive correction and optimal age to primarily implant an IOL is debated.

Unilateral Cataract

The IATS transformed our understanding of the management of visually significant unilateral cataract in infants 6 months and younger. At both 1 and 4.5 years of follow-up, there was no significant difference in visual acuity with primary IOL versus aphakic CL [2••, 14]. However, the IOL group had significantly more adverse events (81 versus 56% having at least one) and additional surgeries (72 vs 16%), most commonly related to visual axis opacification (VAO) [3••, 15]. Thirty-one percent had glaucoma-related adverse events at 4.8 years, with no difference between groups and greater risk with earlier surgery [4]. IOL implantation was overall 5.5% more expensive, despite higher patient costs for CL [6]. Other outcome measures included the overall prevalence of strabismus, which increased during follow-up with rates of strabismus surgery similar at 5 years between groups, as were stereopsis outcomes [2••, 5, 16]. Thus, aphakic CL are recommended for infants under 6 months if feasible for the child and caregivers.

Two recent survey studies suggest global practice patterns support these findings, with over 80% of respondents managing unilateral cataract younger than 6 months with aphakic CL [12••, 17]. While IATS is a pivotal study, it is not broadly generalizable given only unilateral cataracts were included and some methodological concerns have been raised. It has been suggested that the minimum postoperative topical steroid regime of four times daily was less aggressive than other studies; however, the IATS authors reported that the frequency was often increased based on postoperative inflammation [18, 19]. Furthermore, other markers of visual function, such as contrast sensitivity and visual fields, were not assessed, although these may be difficult to test in young children [20, 21].

The optimal timing for primary IOL in unilateral cataract has not been elucidated. While primary IOL facilitates continuous visual stimulation through partial refractive correction, aphakic CL enable flexibility and power adjustment as the child grows. There is relatively equal preference globally for primary IOL versus CL after 6 months of age, with North American surgeons favoring aphakic CL [12••]. While approximately half of surveyed Indian ophthalmologists prefer primary IOL for infants aged 6 to 12 months, it is accepted by the majority after 1 year [17]. Differences in regional practice patterns may reflect surgical volumes, availability of CL, and access to specialists, with environmental conditions also impacting CL wear. Primary IOL has been advocated in children aged 7 to 22 months, based on a lower rate of adverse events at 5 years compared to the IATS [22•]. However, direct comparison is limited as this retrospective study was of small sample size and included both unilateral and bilateral cases.

Finally, a meta-analysis suggested that surgery within the first month of life significantly increases the risk of secondary glaucoma, while pseudophakia was associated with reduced risk [23]. However, the median age at surgery was significantly higher in these children and only 22.6% had IOL implantation of which only two eyes developed secondary glaucoma. Furthermore, the studies were nonrandomized and retrospective. Thus, long-term prospective randomized trials are needed to better understand the optimal age for primary IOL in children older than 6 months.

Bilateral Cataract

Refractive error following bilateral cataract surgery can be managed with primary IOL implantation, aphakic CL, or spectacles, as there is less risk of aniseikonia. Secondary IOL implantation may be considered once axial elongation has stabilized, or earlier if compliance with aphakic correction is of concern. Superior visual outcomes have been reported following bilateral compared to unilateral cataract surgery [24, 25], with approximately 75% of children having long-term visual acuity 20/40 or better [26, 27]. This relates to the greater amblyogenic stimulus of monocular deprivation. Worse outcomes are associated with baseline nystagmus, absence of primary IOL, and surgery prior to age 1, likely secondary to amblyopia in congenital cases [26].

IoLunder2, a prospective cohort study from the British Isles of children undergoing cataract surgery with or without primary IOL before 2 years of age, found similar results to the IATS for unilateral cataract. However, primary IOL for bilateral cases was associated with better visual outcomes, although reoperation was significantly higher at 1 year [28••]. Younger age at surgery was a predictor of secondary glaucoma in bilateral cases and significant microphthalmos (axial length less than 16 mm) increased the risk in unilateral disease, while IOL implantation did not reduce the risk [28••]. Globally, most surgeons select aphakic refractive correction to manage bilateral cataract before 6 months, while practices are variable for older children, with a trend toward favoring primary IOL after 1–2 years [12••, 17]. In a multicenter registry of children younger than 13 years of age, the odds of primary IOL implantation were significantly greater in children 2 years or older, and were lower in bilateral compared to unilateral cases younger than 2 years [29•]. There is no accepted minimum age for implantation, highlighting the need for high-quality prospective studies [7••]. In our practice, children will receive a primary IOL in most cases above the age of 1. But given the absence of published long-term data on this population, primary IOL implantation prior to age 2 years requires thorough informed consent with the parents highlighting the child's individualized risks.

In patients with bilaterally dense cataracts, immediate sequential bilateral surgery is an alternative to minimize amblyogenic delay for the second eye surgery or when the child is at increased risk from general anesthesia. It is associated with similar visual outcomes and rate of adverse events compared to consecutive operations, while offering potential economic advantages [30, 31]. There is a low but finite risk for bilateral endophthalmitis or toxic anterior segment syndrome, which needs to be discussed with the family on a case-by-case basis, and this needs to be weighed against the anesthetic risk. In such cases, it is our practice to treat each eye as individual cases, with separate instruments, surgical scrub, prep and drapes, and different batch numbers for consumables for each eye.

IOL Power Calculation

Preoperatively, it is important to consider factors influencing the refractive outcome following primary IOL implantation, including baseline axial length, age at surgery, future axial elongation of the infant eye, and laterality. In the IATS, baseline axial length was on average 0.6 mm shorter in cataractous eyes compared to fellow eyes, with significantly increased axial growth following IOL implantation compared to aphakia at 1 year [32]. However, both groups had similar change in axial length and refractive growth rate at 5 years [33, 34]. Multiple studies have demonstrated a progressive myopic shift following primary IOL, with rates significantly higher in younger children and within the first few years of life [35–38]. Myopic shift is also accelerated in unilateral compared to bilateral pseudophakia [37, 39].

Target Refraction

While some may aim for immediate postoperative emmetropia to avoid the potential amblyogenic stimulus of uncorrected ametropia, myopic shift throughout life may later necessitate an IOL exchange. Thus, undercorrection using age-adjusted target refractions has been proposed in planning for future axial growth [36, 40], coupled with spectacle correction of residual hyperopic ametropia. The Enyedi et al. guidelines, targeting postoperative refraction of + 6 for a 1-year-old, + 5 for 2-year, + 4 for 3-year, + 3 for 4-year, + 2 for 5-year, + 1 for 6-year, plano for 7-year, and − 1 to − 2 for patients 8 years and older, were recently validated, with almost half of the cohort within 1.0 D of expected refraction at 7 years [40, 41••]. Myopic shift was not significantly different for unilateral pseudophakic children aged 2 to 6 years who were targeted for emmetropia or undercorrected by two or more diopters [42]. While the Delphi panel agreed on targeting residual hyperopia adjusted for age [7••], refractive goals must consider likelihood of wearing spectacle overcorrection for immediate significant hyperopia, as well as family history of refractive error.

IOL Power Calculation and Formulas

Compared to adults, pediatric power calculations are prone to several errors. Baseline office axial length and keratometry measurements are the gold standard, as lack of fixation under general anesthesia may introduce inaccuracies [43]. However, pediatric cases frequently necessitate intraoperative A-scan, with immersion technique preferred as contact yields significantly shorter measurements by mean 0.27 mm [7••, 44]. This is particularly important when patient cooperation or cataract morphology limit accurate preoperative refraction. Furthermore, the formulas commonly employed are based on adult normative data, which are not reflective of pediatric intraocular dimensions.

Non-consensus in IOL power calculation formula selection is an important area for future study [7••]. Comparison of refractive outcome studies is limited by considerable variability in mean age at surgery, follow-up duration, and axial length, as well as use of different biometry techniques, prediction formula, A-constants and IOLs. Significantly lower prediction error (the difference in predicted and actual postoperative spherical equivalent refraction, PE) has been reported for Holladay 1 [45] and SRK/T [45, 46], while others report improved PE with Hoffer Q [43], Holladay 2 [47], and SRK II [48], yielding no consensus on which is superior. Significantly higher prediction error has been reported for shorter eyes [45, 49••], manufacturer lens constants [45, 46], and ciliary sulcus IOL placement [50], while others suggest no factors influence calculation accuracy [51]. Nihalani et al. recently established benchmark standards for pediatric PE, with 66% of children older than 2 years within 1D of expected refraction [49]. This may serve as an important comparison for future studies. With adult power formulas leading to greater PE in pediatric eyes, the development of a validated pediatric-specific formula would be valuable.

IOL Selection

Several IOL designs and materials have been used in pediatric cataract surgery. Foldable hydrophobic acrylic IOLs are the most preferred for implantation in the capsular bag [17, 52–55]. While similar rates of PCO are reported compared to PMMA, deposits on the IOL surface and posterior synechiae are significantly less frequent [53]. Furthermore, the flexible nature enables implantation through smaller corneal incisions. However, whether to place a one-piece or three-piece hydrophobic acrylic in the capsular bag is a point of debate, with no comparative studies in the pediatric literature [7••]. While the association of some hydrophobic acrylic IOLs with glistenings is of concern, there is only one report in the pediatric literature [56, 57]. We have now adopted the use of lens implants that are not associated with glistenings.

Recently, hydrophilic acrylic IOLs have also been proposed for use in children, but there have been no direct comparative studies to hydrophobic implants [58, 59]. The "bag-in-the-lens" is a unique monofocal spherical hydrophilic IOL with an encircling groove in the optic to secure equally sized anterior and posterior capsular leaflets, to prevent lens epithelial cell migration [60]. It is associated with VAO in less than 10% of cases at long-term follow-up [61•].

Other selection considerations include aspheric and multifocal IOLs. In a recent randomized prospective study of 23 children (40 eyes), higher order aberrations and contrast sensitivity were significantly better with an aspheric compared to a spherical IOL, but the visual and refractive outcomes were similar [62]. Multifocal IOLs have also been proposed for children (aged 2–14 years, follow-up 27.4 months) [63]. A study of children older than 5 years (1 year follow-up) reported similar visual outcomes, contrast sensitivity, and stereopsis, but improved distance-corrected near acuity with a multifocal compared to a monofocal IOL [64]. Then, 30.5% of respondents in a survey of AAPOS members would consider using multifocals [54]. However, decreased contrast sensitivity and the presence of multiple blurred, superimposed images from the focal points of a multifocal are potential amblyogenic stimuli [65, 66]. Accurate preoperative biometry and IOL centration required for multifocals may not be feasible in children [66]. Furthermore, multifocal IOLs require a postoperative refraction near emmetropia [65], yet axial growth continues into the second decade [67]. Given no currently available long-term data from prospective randomized trials, we do not offer multifocals as standard of care for children of amblyogenic age or before axial growth has stabilized.

Intraoperative Considerations

Anterior Capsule Management

Various techniques have been described for managing the anterior capsule (AC) in children, including manual continuous curvilinear capsulorhexis (MCCC), two-incision push-pull (TIPP), and vitrectorhexis. TIPP capsulorhexis is a reliable method of producing a circular rhexis by joining two opposite semicircular tears and is less dependent on surgeon experience [68–70]. A four-incision approach has also been described [71]. Vitrectorhexis is another alternative, with low reported AC tear rate of approximately 4–5% [72, 73]. In a retrospective review of 339 eyes, the risk of AC tear was higher with vitrectorhexis in children older than 6 years and with MCCC in the younger cohort [72]. Thus, vitrectorhexis is preferred to manage the highly elastic infant AC, while the finer control of MCCC offers superior outcomes in older children. This was confirmed in a survey of AAPOS member preferences [74]. There was also consensus among the Delphi panel that MCCC offers advantages when primarily implanting an IOL, while vitrectorhexis is favored when planning for aphakia in children 2 years and younger [7••]. Anterior and posterior capsulorhexis diameters of 4 to 5 mm are associated with reduced anterior capsular contraction and VAO [75]. Although anterior capsular elasticity, visualization, and success of MCCC improve with use of Trypan blue [76, 77], there is no clear consensus on its use in pediatric AC management [7••]. While not routine, we prefer to use it in the context of significant opacity of the anterior capsule or lens substance.

Femtosecond laser has also been proposed for the management of both anterior and posterior capsules in children. An early case series reported increased capsulotomy diameters than were programmed due to inherent capsule elasticity [78]. The Bochum formula was proposed to account for significantly greater capsular deviations in younger children [79•]. Fung et al. recently applied this formula to a new femtosecond laser platform, with final median BCVA 0.20 logMAR and median duration of laser process under 3 min [80]. However, use of femtosecond laser may be limited by lack of availability and cost of the laser platform, learning curve, and potential increase in case duration.

IOL Placement

Implantation in the capsular bag is preferred for primary IOL when there is adequate support. Ciliary sulcus IOL positioning evaluated by UBM is associated with significantly increased vertical IOL decentration, IOL tilt, and crowding of the anterior chamber, although visual outcomes are similar to in-the-bag placement [81•]. Furthermore, sulcus fixation may increase the risk of secondary glaucoma [81•]. Yet, it offers a good alternative when there is poor capsular support or in cases of secondary IOL when the bag cannot be opened. However, in-the-bag placement is also preferred for secondary IOL when the residual capsule may be opened and the Soemmerings ring is debulked, particularly essential for one-piece lens implants. Posterior chamber IOL placement is preferred to anterior chamber IOLs, which are associated with corectopia, haptic migration, and implant pigment deposits [82] and should not be used in children.

Posterior Capsule Management

Visual axis opacification (VAO) is one of the most common long-term complications of pediatric cataract surgery. VAO occurs at extremely high rates when the posterior capsule is left intact, and ranges from 4 to 100% depending on whether posterior capsulotomy and anterior vitrectomy are performed [3••, 24, 83–86]. Whether implantation of an IOL influences VAO is controversial, with some reports of higher rates in pseudophakic children [3••, 25], while others suggest no difference with aphakia [24]. Proliferation of residual lens epithelial cells is more common in younger children, post-traumatic cataract, and in the presence of other ocular anomalies [84, 87–89].

Primary posterior curvilinear capsulorhexis (PCC) with or without anterior vitrectomy (AV) aims to remove the "scaffold" onto which lens epithelial cells can grow. Secondary Nd:YAG laser capsulotomy is an option if the posterior capsule (PC) is left intact, although this may necessitate a second anesthesia if the child is uncooperative in clinic. Primary PCC/AV significantly decrease postoperative lens reproliferation [83, 90]. However, the upper age limit for performing PCC/AV is debated. Most experts prefer PCC/AV for all children younger than 5 years and uncooperative children aged 5 to 8. The Delphi panel did not reach consensus on the management of cooperative children aged 5 to 8 or those older than 8 years who are likely uncooperative, highlighting an important question for further research [7••]. The PC is typically left intact for cooperative children 8 years and older who have less significant epithelial proliferation and may undergo secondary laser capsulotomy successfully. The risk versus benefits of PCC, including general anesthesia concerns and developmental considerations, should be discussed in detail with caregivers preoperatively.

PCC and AV can be performed before or after IOL implantation via a limbal or pars plana approach. Both vitrectorhexis or manual technique using intraoperative forceps are effective [91, 92]. A recent randomized trial reported faster performance of pars plana vitrectorhexis and AV after IOL implant with a 25 compared to 20-gauge system, but some difficulty in maneuvering the 25-gauge system was associated with smaller posterior rhexis size [93•]. Both anterior and posterior vitrectorhexis approaches are associated with similar intraoperative stability and 1-year outcomes with a 25-gauge system [94•]. An endoilluminator used externally may aid in visualization of the posterior capsule and anterior hyaloid face [95]. Trypan blue may also facilitate posterior capsulorhexis through changes to intrinsic capsular elasticity [96]. Finally, although it is not essential in standard practice, two recent papers have reported using triamcinolone acetonide to visualize the anterior vitreous face and residual strands in the anterior chamber [7••, 97, 98].

Posterior optic capture, in which the optic is placed through the posterior capsulorhexis with haptics in-the-bag or the sulcus, has been proposed as an alternative to anterior vitrectomy. A meta-analysis of 10 studies (282 eyes) found significantly improved rates of IOL decentration and VAO with optic capture, although visual outcomes were similar [99•]. It is hypothesized that fusion of the two capsular surfaces may limit the growth of epithelial cells onto the visual axis. Since publication of this meta-analysis, a prospective randomized trial found no difference in the development of VAO or deposits on the IOL [100•]. A recent retrospective case control study (52 eyes) also found similar rates of VAO and other complications with in-the-bag IOL and vitrectomy compared to optic capture [101].

Intraoperative Medications

A major area of non-consensus in the management of pediatric cataract is the routine use of intracameral prophylactic pharmacotherapy, given a lack of high-quality evidence in the literature. While intracameral antibiotic was not found to reduce postoperative fibrin formation in a pediatric cohort [102], a recent large meta-analysis demonstrated reduced endophthalmitis rates with intracameral cefuroxime and moxifloxacin and good safety profile in adults [103]. Approximately 70% of AAPOS members recently reported using intracameral antibiotic for endophthalmitis prophylaxis, although there was no consensus on drug of choice [104•].

In a retrospective case control study, the use of intracameral triamcinolone acetonide was associated with significantly less VAO and inflammation, with no reports of elevated postoperative IOP or endophthalmitis [105]. However, it is difficult to assess causality as both the triamcinolone and control groups received systemic and topical steroids postoperatively. One case series (24 eyes) reported no increased glaucoma risk with intracameral dexamethasone and rate of significant VAO was high at 34 months [106].

Postoperative Considerations

Postoperative Medications

Postoperative pharmacotherapy regime should include topical steroid, antibiotic, and dilating drops. We frequently use topical moxifloxacin four times daily, prednisolone 1% 4–6 times daily with taper based on clinical response, and atropine 0.5–1% twice daily. A combination drop may be substituted to facilitate ease for the caregiver. A recent randomized phase 3B trial comparing difluprednate 0.05% to prednisolone 1% four times daily for children younger than 3 years showed similar safety and efficacy [107•]. Difluprednate was associated with transient IOP elevation during treatment, but inflammatory control was faster. Topical ketorolac 0.5% for children with intact PC demonstrated similar rates of VAO compared to PCC/AV alone [108]. However, the feasibility of caregivers outside of a study protocol instilling topical ketorolac for 3 months, as frequently as 12 times daily in the early postoperative period, is questionable.

Intracameral triamcinolone acetonide (1.2 mg/0.03 mL) injection has also been compared to postoperative oral prednisolone (1 mg/kg/day), with similar incidence of VAO, signs of inflammation, and IOP at 1 year [109]. We prefer to only utilize oral prednisolone on postoperative day 1 if the child has a fibrinous anterior chamber reaction, with taper based on clinical improvement and close IOP monitoring.

Visual Rehabilitation

Amblyopia therapy is critical to success following pediatric cataract surgery, particularly in unilateral cases, and should begin shortly after lensectomy. A multidisciplinary approach involving pediatric ophthalmologists, orthoptists, nurses, optometrists, opticians, and contact lens specialists facilitates long-term monitoring and care of these children. Parents should be well-informed of the intensive follow-up required after surgery, the different options for visual rehabilitation, and potential compliance issues must be identified and addressed immediately.

When possible, aphakia is managed with silicone elastomer (SE), rigid gas permeable (RGP), or hydrogel CL. A regression formula and modified A-constant were validated to estimate initial CL power based on preoperative biometry, when refraction is difficult postoperatively [110, 111]. The IATS reported similar visual outcomes irrespective of CL type, although RGP necessitated more frequent replacement [112]. SE lenses may be worn for extended periods but are less effective at correcting astigmatism, while RGP offer more customization but are limited to daily wear [113••]. While experts prefer SE lenses for children under age 3, practices are variable for older children [7••]. Frequent postoperative refractions are imperative to confirm accuracy of CL power, as residual ametropia is amblyogenic. Although the capacity to regularly change CL power is an advantage, this must be balanced with local availability of CL services, as well as economic implications for caregivers.

Conclusions

Two years after publication of the Delphi paper, we have yet to fully answer questions of uncertainty in pediatric cataract management despite a growing literature. There is a need to clarify the optimal age for primary IOL implantation, as well as appropriate windows for managing the posterior capsule primarily. Furthermore, an IOL power calculation formula derived from pediatric normative data may improve prediction error in this cohort. The impact of advances such as next-generation sequencing, bag-in-the-lens, optic capture, and femtosecond laser on our understanding and outcomes of pediatric cataract surgery are yet to be determined. Targeted multicenter randomized controlled trials with rigorous methodology and long-term follow-up like the IATS will enable us to move toward consensus worldwide.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

References

Papers of particular interest, published recently, have been highlighted as:
- • Of importance
- •• Of major importance

1. Infant Aphakia Treatment Study G, Lambert SR, Buckley EG, Drews-Botsch C, DuBois L, Hartmann E, et al. The infant aphakia treatment study: design and clinical measures at enrollment. Arch Ophthalmol. 2010;128(1):21–7. https://doi.org/10.1001/archophthalmol.2009.350.
2.•• Infant Aphakia Treatment Study G, Lambert SR, Lynn MJ, Hartmann EE, DuBois L, Drews-Botsch C, et al. Comparison of contact lens and intraocular lens correction of monocular aphakia during infancy: a randomized clinical trial of HOTV optotype acuity at age 4.5 years and clinical findings at age 5 years. JAMA Ophthalmol. 2014;132(6):676–82. https://doi.org/10.1001/jamaophthalmol.2014.531 **This manuscript highlights the final visual acuity outcomes of the Infant Aphakic Treatment Study and makes recommendations for treating infants 6 months and younger with unilateral congenital cataract.**
3.•• Plager DA, Lynn MJ, Buckley EG, Wilson ME, Lambert SR. Infant aphakia treatment study G. Complications in the first 5 years following cataract surgery in infants with and without intraocular lens implantation in the infant Aphakia treatment study. Am J Ophthalmol. 2014;158(5):892–8. https://doi.org/10.1016/j.ajo.2014.07.031 **The rate of adverse events at final follow-up for children in the IATS treated with aphakic contact lenses versus primary IOL implantation is reviewed.**
4. Freedman SF, Lynn MJ, Beck AD, Bothun ED, Orge FH, Lambert SR, et al. Glaucoma-related adverse events in the first 5 years after unilateral cataract removal in the infant Aphakia treatment study. JAMA Ophthalmol. 2015;133(8):907–14. https://doi.org/10.1001/jamaophthalmol.2015.1329.
5. Hartmann EE, Stout AU, Lynn MJ, Yen KG, Kruger SJ, Lambert SR, et al. Stereopsis results at 4.5 years of age in the infant aphakia treatment study. Am J Ophthalmol. 2015;159(1):64–70 e1–2. https://doi.org/10.1016/j.ajo.2014.09.028.
6. Kruger SJ, DuBois L, Becker ER, Morrison D, Wilson L, Wilson ME Jr, et al. Cost of intraocular lens versus contact lens treatment

after unilateral congenital cataract surgery in the infant aphakia treatment study at age 5 years. Ophthalmology. 2015;122(2):288–92. https://doi.org/10.1016/j.ophtha.2014.08.037.

7.•• Serafino M, Trivedi RH, Levin AV, Wilson ME, Nucci P, Lambert SR, et al. Use of the Delphi process in paediatric cataract management. The British journal of ophthalmology. 2016;100(5):611–5. https://doi.org/10.1136/bjophthalmol-2015-307287 **Areas of agreement and non-consensus in the management of pediatric cataract were identified using a Delphi panel of experts in the field. Five important questions for future research were highlighted.**

8. Gillespie RL, O'Sullivan J, Ashworth J, Bhaskar S, Williams S, Biswas S, et al. Personalized diagnosis and management of congenital cataract by next-generation sequencing. Ophthalmology. 2014;121(11):2124–37 e1–2. https://doi.org/10.1016/j.ophtha.2014.06.006.

9. Musleh M, Ashworth J, Black G, Hall G. Improving diagnosis for congenital cataract by introducing NGS genetic testing. BMJ Qual Improv Rep. 2016;5(1). doi:https://doi.org/10.1136/bmjquality.u211094.w4602.

10.• Musleh M, Hall G, Lloyd IC, Gillespie RL, Waller S, Douzgou S, et al. Diagnosing the cause of bilateral paediatric cataracts: comparison of standard testing with a next-generation sequencing approach. Eye (Lond). 2016;30(9):1175–81. https://doi.org/10.1038/eye.2016.105 **This retrospective review demonstrated a higher diagnostic yield of next generation sequencing compared to standard investigations for bilateral pediatric cataract.**

11. Birch EE, Stager DR. The critical period for surgical treatment of dense congenital unilateral cataract. Invest Ophthalmol Vis Sci. 1996;37(8):1532–8.

12.•• Koo EB, VanderVeen DK, Lambert SR. Global practice patterns in the management of infantile cataracts. Eye Contact Lens. 2018. Doi:10.1097/ICL.0000000000000461; **This manuscript reports the results of an international survey of pediatric ophthalmologists regarding their cataract surgery practice patterns.**

13. Kim DH, Kim JH, Kim SJ, Yu YS. Long-term results of bilateral congenital cataract treated with early cataract surgery, aphakic glasses and secondary IOL implantation. Acta Ophthalmol. 2012;90(3):231–6. https://doi.org/10.1111/j.1755-3768.2010.01872.x.

14. Infant Aphakia Treatment Study G, Lambert SR, Buckley EG, Drews-Botsch C, DuBois L, Hartmann EE, et al. A randomized clinical trial comparing contact lens with intraocular lens correction of monocular aphakia during infancy: grating acuity and adverse events at age 1 year. Arch Ophthalmol. 2010;128(7):810–8. https://doi.org/10.1001/archophthalmol.2010.101.

15. Plager DA, Lynn MJ, Buckley EG, Wilson ME, Lambert SR, Treatment IA. Study G. Complications, adverse events, and additional intraocular surgery 1 year after cataract surgery in the infant Aphakia treatment study. Ophthalmology. 2011;118(12):2330–4. https://doi.org/10.1016/j.ophtha.2011.06.017.

16. Bothun ED, Cleveland J, Lynn MJ, Christiansen SP, Vanderveen DK, Neely DE, et al. One-year strabismus outcomes in the infant Aphakia treatment study. Ophthalmology. 2013;120(6):1227–31. https://doi.org/10.1016/j.ophtha.2012.11.039.

17. Kemmanu V, Rathod P, Rao HL, Muthu S, Jayadev C. Management of cataracts and ectopia lentis in children: practice patterns of pediatric ophthalmologists in India. Indian J Ophthalmol. 2017;65(9):818–25. https://doi.org/10.4103/ijo.IJO_896_16.

18. Sukhija J, Ram J, Kaur S. Complications in the first 5 years following cataract surgery in infants with and without intraocular lens implantation in the infant aphakia treatment study. Am J Ophthalmol. 2014;158(6):1360–1. https://doi.org/10.1016/j.ajo.2014.09.018.

19. Plager DA, Lynn MJ, Lambert SR, Buckley EG, Wilson ME, Infant Aphakia Treatment Study G. Reply: To Am J Ophthalmol 2014;158(6):1361–1362. doi:https://doi.org/10.1016/j.ajo.2014.09.019.

20. Sueke H, Chandna A. Comments on infant aphakia treatment study 4.5-year results. JAMA Ophthalmol. 2014;132(12):1491–2. https://doi.org/10.1001/jamaophthalmol.2014.3532.

21. Lambert SR, Lynn MJ, Hartmann EE. Infant Aphakia treatment study G. In reply JAMA Ophthalmol. 2014;132(12):1492–3. https://doi.org/10.1001/jamaophthalmol.2014.3542.

22.• Struck MC. Long-term results of pediatric cataract surgery and primary intraocular lens implantation from 7 to 22 months of life. JAMA Ophthalmol. 2015;133(10):1180–3. https://doi.org/10.1001/jamaophthalmol.2015.2062 **This retrospective review of 14 eyes of 10 patients demonstrated a lower rate of adverse events compared to the IATS in children aged 7 to 22 months following primary IOL implantation.**

23. Mataftsi A, Haidich AB, Kokkali S, Rabiah PK, Birch E, Stager DR Jr, et al. Postoperative glaucoma following infantile cataract surgery: an individual patient data meta-analysis. JAMA Ophthalmol. 2014;132(9):1059–67. https://doi.org/10.1001/jamaophthalmol.2014.1042.

24. Ambroz SC, Toteberg-Harms M, Hanson JVM, Funk J, Barthelmes D, Gerth-Kahlert C. Outcome of pediatric cataract surgeries in a tertiary center in Switzerland. J Ophthalmol. 2018;2018:3230489–10. https://doi.org/10.1155/2018/3230489.

25. Lim Z, Rubab S, Chan YH, Levin AV. Management and outcomes of cataract in children: the Toronto experience. J AAPOS. 2012;16(3):249–54. https://doi.org/10.1016/j.jaapos.2011.12.158.

26. Bonaparte LA, Trivedi RH, Ramakrishnan V, Wilson ME. Visual acuity and its predictors after surgery for bilateral cataracts in children. Eye (Lond). 2016;30(9):1229–33. https://doi.org/10.1038/eye.2016.166.

27. Sukhija J, Ram J, Gupta N, Sawhney A, Kaur S. Long-term results after primary intraocular lens implantation in children operated less than 2 years of age for congenital cataract. Indian J Ophthalmol. 2014;62(12):1132–5. https://doi.org/10.4103/0301-4738.149131.

28.•• Solebo AL, Russell-Eggitt I, Cumberland PM, Rahi JS, British Isles Congenital Cataract Interest G. Risks and outcomes associated with primary intraocular lens implantation in children under 2 years of age: the IoLunder2 cohort study. Br J Ophthalmology. 2015;99(11):1471–6. https://doi.org/10.1136/bjophthalmol-2014-306394 **This prospective cohort study assessed visual outcomes and complication rates for primary IOL implantation in unilateral and bilateral cataract surgery for children younger than 2 years.**

29.• Repka MX, Dean TW, Lazar EL, Yen KG, Lenhart PD, Freedman SF, et al. Cataract surgery in children from birth to less than 13 years of age: baseline characteristics of the cohort. Ophthalmology. 2016;123(12):2462–73. https://doi.org/10.1016/j.ophtha.2016.09.003 **A manuscript reporting the baseline characteristics and refractive prediction error for a large, prospective PEDIG registry of children younger than 13 years.**

30. Dave H, Phoenix V, Becker ER, Lambert SR. Simultaneous vs sequential bilateral cataract surgery for infants with congenital cataracts: visual outcomes, adverse events, and economic costs. Arch Ophthalmol. 2010;128(8):1050–4. https://doi.org/10.1001/archophthalmol.2010.136.

31. Magli A, Forte R, Rombetto L. Long-term outcome of primary versus secondary intraocular lens implantation after simultaneous removal of bilateral congenital cataract. Graefes Arch Clin Exp Ophthalmol. 2013;251(1):309–14. https://doi.org/10.1007/s00417-012-1979-7.

32. Lambert SR, Lynn MJ, DuBois LG, Cotsonis GA, Hartmann EE, Wilson ME, et al. Axial elongation following cataract surgery during the first year of life in the infant Aphakia treatment study. Invest Ophthalmol Vis Sci. 2012;53(12):7539–45. https://doi.org/10.1167/iovs.12-10285.
33. Lambert SR, Cotsonis G, DuBois L, Wilson ME, Plager DA, Buckley EG, et al. Comparison of the rate of refractive growth in aphakic eyes versus pseudophakic eyes in the infant Aphakia treatment study. J Cataract Refract Surg. 2016;42(12):1768–73. https://doi.org/10.1016/j.jcrs.2016.09.021.
34. Wilson ME, Trivedi RH, Weakley DR Jr, Cotsonis GA, Lambert SR. Infant Aphakia treatment study G. globe axial length growth at age 5 years in the infant Aphakia treatment study. Ophthalmology. 2017;124(5):730–3. https://doi.org/10.1016/j.ophtha.2017.01.010.
35. Dahan E, Drusedau MU. Choice of lens and dioptric power in pediatric pseudophakia. J Cataract Refract Surg. 1997;23(Suppl 1):618–23.
36. Crouch ER, Crouch ER Jr, Pressman SH. Prospective analysis of pediatric pseudophakia: myopic shift and postoperative outcomes. J AAPOS. 2002;6(5):277–82.
37. Vasavada AR, Raj SM, Nihalani B. Rate of axial growth after congenital cataract surgery. Am J Ophthalmol. 2004;138(6):915–24. https://doi.org/10.1016/j.ajo.2004.06.068.
38. Magli A, Forte R, Carelli R, Rombetto L, Magli G. Long-term outcomes of primary intraocular Lens implantation for unilateral congenital cataract. Semin Ophthalmol. 2016;31(6):548–53. https://doi.org/10.3109/08820538.2015.1009556.
39. Valera Cornejo DA, Flores BA. Relationship between preoperative axial length and myopic shift over 3 years after congenital cataract surgery with primary intraocular lens implantation at the National Institute of ophthalmology of Peru, 2007-2011. Clin Ophthalmol. 2018;12:395–9. https://doi.org/10.2147/OPTH.S152560.
40. Enyedi LB, Peterseim MW, Freedman SF, Buckley EG. Refractive changes after pediatric intraocular lens implantation. Am J Ophthalmol. 1998;126(6):772–81.
41.•• Sachdeva V, Katukuri S, Kekunnaya R, Fernandes M, Ali MH. Validation of guidelines for undercorrection of intraocular lens power in children. Am J Ophthalmol. 2017;174:17–22. https://doi.org/10.1016/j.ajo.2016.10.017 **This study assessed the prediction error at 7 years of age for children who had primary IOL implantation using the Enyedi et al. guidelines for refractive under-correction.**
42. Lambert SR, Archer SM, Wilson ME, Trivedi RH, del Monte MA, Lynn M. Long-term outcomes of undercorrection versus full correction after unilateral intraocular lens implantation in children. Am J Ophthalmol. 2012;153(4):602–8, 8 e1. https://doi.org/10.1016/j.ajo.2011.08.046.
43. Nihalani BR, VanderVeen DK. Comparison of intraocular lens power calculation formulae in pediatric eyes. Ophthalmology. 2010;117(8):1493–9. https://doi.org/10.1016/j.ophtha.2009.12.031.
44. Trivedi RH, Wilson ME. Axial length measurements by contact and immersion techniques in pediatric eyes with cataract. Ophthalmology. 2011;118(3):498–502. https://doi.org/10.1016/j.ophtha.2010.06.042.
45. Vanderveen DK, Trivedi RH, Nizam A, Lynn MJ, Lambert SR. Infant Aphakia treatment study G. predictability of intraocular lens power calculation formulae in infantile eyes with unilateral congenital cataract: results from the infant Aphakia treatment study. Am J Ophthalmol. 2013;156(6):1252–60 e2. https://doi.org/10.1016/j.ajo.2013.07.014.
46. Vasavada V, Shah SK, Vasavada VA, Vasavada AR, Trivedi RH, Srivastava S, et al. Comparison of IOL power calculation formulae for pediatric eyes. Eye (Lond). 2016;30(9):1242–50. https://doi.org/10.1038/eye.2016.171.
47. Trivedi RH, Wilson ME, Reardon W. Accuracy of the Holladay 2 intraocular lens formula for pediatric eyes in the absence of preoperative refraction. J Cataract Refract Surg. 2011;37(7):1239–43. https://doi.org/10.1016/j.jcrs.2011.01.021.
48. Kekunnaya R, Gupta A, Sachdeva V, Rao HL, Vaddavalli PK, Om PV. Accuracy of intraocular lens power calculation formulae in children less than two years. Am J Ophthalmol. 2012;154(1):13–9 e2. https://doi.org/10.1016/j.ajo.2011.11.031.
49.•• Nihalani BR, VanderVeen DK. Benchmarks for outcome indicators in pediatric cataract surgery. Eye (Lond). 2017;31(3):417–21. https://doi.org/10.1038/eye.2016.240 **This retrospective study established benchmarks for visual and refractive outcome indicators for children older than 2 years following bilateral cataract surgery and primary IOL implantation.**
50. Thanapaisal S, Wongwai P, Phanphruk W, Suwannaraj S. Accuracy of intraocular lens calculation by SRK/T formula in pediatric cataracts. J Med Assoc Thail. 2015;98(Suppl 7):S198–203.
51. Ashworth JL, Maino AP, Biswas S, Lloyd IC. Refractive outcomes after primary intraocular lens implantation in infants. Br J Ophthalmol. 2007;91(5):596–9. https://doi.org/10.1136/bjo.2006.108571.
52. Bhusal S, Ram J, Sukhija J, Pandav SS, Kaushik S. Comparison of the outcome of implantation of hydrophobic acrylic versus silicone intraocular lenses in pediatric cataract: prospective randomized study. Can J Ophthalmol. 2010;45(5):531–6. https://doi.org/10.3129/i10-045.
53. Wilson ME, Elliott L, Johnson B, Peterseim MM, Rah S, Werner L, et al. AcrySof acrylic intraocular lens implantation in children: clinical indications of biocompatibility. J AAPOS. 2001;5(6):377–80.
54. Wilson ME, Trivedi RH. Choice of intraocular lens for pediatric cataract surgery: survey of AAPOS members. J Cataract Refract Surg. 2007;33(9):1666–8. https://doi.org/10.1016/j.jcrs.2007.05.016.
55. Wilson ME Jr, Trivedi RH, Buckley EG, Granet DB, Lambert SR, Plager DA, et al. ASCRS white paper. Hydrophobic acrylic intraocular lenses in children. J Cataract Refract Surg. 2007;33(11):1966–73. https://doi.org/10.1016/j.jcrs.2007.06.047.
56. Werner L. Glistenings and surface light scattering in intraocular lenses. J Cataract Refract Surg. 2010;36(8):1398–420. https://doi.org/10.1016/j.jcrs.2010.06.003.
57. Lapid-Gortzak R, van der Meulen IJ, Jellema HM, Mourits MP, Nieuwendaal CP. Seven-year follow-up of unilateral multifocal pseudophakia in a child. Int Ophthalmol. 2017;37(1):267–70. https://doi.org/10.1007/s10792-016-0232-5.
58. Kleinmann G, Zaugg B, Apple DJ, Bleik J. Pediatric cataract surgery with hydrophilic acrylic intraocular lens. J AAPOS. 2013;17(4):367–70. https://doi.org/10.1016/j.jaapos.2013.04.007.
59. Adhikari S, Shrestha UD. Pediatric cataract surgery with hydrophilic acrylic intraocular lens implantation in Nepalese children. Clin Ophthalmol. 2018;12:7–11. https://doi.org/10.2147/OPTH.S149806.
60. Tassignon MJ, De Veuster I, Godts D, Kosec D, Van den Dooren K, Gobin L. Bag-in-the-lens intraocular lens implantation in the pediatric eye. J Cataract Refract Surg. 2007;33(4):611–7. https://doi.org/10.1016/j.jcrs.2006.12.016.
61.• Van Looveren J, Ni Dhubhghaill S, Godts D, Bakker E, De Veuster I, Mathysen DG, et al. Pediatric bag-in-the-lens intraocular lens implantation: long-term follow-up. J Cataract Refract Surg. 2015;41(8):1685–92. https://doi.org/10.1016/j.jcrs.2014.12.057 **The bag-in-the-lens IOL implantation technique was associated with low rates of visual axis opacification at mean 78 month follow up.**
62. Raina UK, Gupta A, Bhambhwani V, Bhushan G, Seth A, Ghosh B. The optical performance of spherical and aspheric intraocular lenses in pediatric eyes: a comparative study. J Pediatr Ophthalmol

Strabismus. 2015;52(4):232–8. https://doi.org/10.3928/01913913-20150520-03.
63. Jacobi PC, Dietlein TS, Konen W. Multifocal intraocular lens implantation in pediatric cataract surgery. Ophthalmology. 2001;108(8):1375–80.
64. Ram J, Agarwal A, Kumar J, Gupta A. Bilateral implantation of multifocal versus monofocal intraocular lens in children above 5 years of age. Graefes Arch Clin Exp Ophthalmol. 2014;252(3):441–7. https://doi.org/10.1007/s00417-014-2571-0.
65. Hunter DG. Multifocal intraocular lenses in children. Ophthalmology. 2001;108(8):1373–4.
66. Rychwalski PJ. Multifocal IOL implantation in children: is the future clear? J Cataract Refract Surg. 2010;36(12):2019–21. https://doi.org/10.1016/j.jcrs.2010.10.009.
67. Wilson ME, Trivedi RH, Burger BM. Eye growth in the second decade of life: implications for the implantation of a multifocal intraocular lens. Trans Am Ophthalmol Soc. 2009;107:120–4.
68. Nischal KK. Two-incision push-pull capsulorhexis for pediatric cataract surgery. J Cataract Refract Surg. 2002;28(4):593–5.
69. Hamada S, Low S, Walters BC, Nischal KK. Five-year experience of the 2-incision push-pull technique for anterior and posterior capsulorrhexis in pediatric cataract surgery. Ophthalmology. 2006;113(8):1309–14. https://doi.org/10.1016/j.ophtha.2006.03.057.
70. Kesarwani SS, Sahu SK. Push-pull technique of capsulorhexis for fibrous plaques on anterior capsules in pediatric cataract surgery. J AAPOS. 2011;15(5):493–4. https://doi.org/10.1016/j.jaapos.2011.06.005.
71. Mohammadpour M. Four-incision capsulorhexis in pediatric cataract surgery. J Cataract Refract Surg. 2007;33(7):1155–7. https://doi.org/10.1016/j.jcrs.2007.02.042.
72. Wilson ME Jr, Trivedi RH, Bartholomew LR, Pershing S. Comparison of anterior vitrectorhexis and continuous curvilinear capsulorhexis in pediatric cataract and intraocular lens implantation surgery: a 10-year analysis. J AAPOS. 2007;11(5):443–6. https://doi.org/10.1016/j.jaapos.2007.03.012.
73. Ilhan O, Coskun M, Keskin U, Ayintap E, Ilhan N, Tuzcu E, et al. Dual approach using vitrectorhexis combined with anterior vitrectomy in pediatric cataract surgery. ISRN Ophthalmol. 2013;2013:124754–5. https://doi.org/10.1155/2013/124754.
74. Bartholomew LR, Wilson ME Jr, Trivedi RH. Pediatric anterior capsulotomy preferences of cataract surgeons worldwide: comparison of 1993, 2001, and 2003 surveys. J Cataract Refract Surg. 2007;33(5):893–900. https://doi.org/10.1016/j.jcrs.2007.03.006.
75. Lin H, Tan X, Lin Z, Chen J, Luo L, Wu X, et al. Capsular outcomes differ with capsulorhexis sizes after pediatric cataract surgery: a randomized controlled trial. Sci Rep. 2015;5:16227. https://doi.org/10.1038/srep16227.
76. Fridman G, Rizzuti AE, Liao J, Rolain M, Deutsch JA, Kaufman SC. Trypan blue as a surgical adjunct in pediatric cataract surgery. J Cataract Refract Surg. 2016;42(12):1774–8. https://doi.org/10.1016/j.jcrs.2016.10.012.
77. Saini JS, Jain AK, Sukhija J, Gupta P, Saroha V. Anterior and posterior capsulorhexis in pediatric cataract surgery with or without trypan blue dye: randomized prospective clinical study. J Cataract Refract Surg. 2003;29(9):1733–7.
78. Dick HB, Schultz T. Femtosecond laser-assisted cataract surgery in infants. J Cataract Refract Surg. 2013;39(5):665–8. https://doi.org/10.1016/j.jcrs.2013.02.032.
79.• Dick HB, Schelenz D, Schultz T. Femtosecond laser-assisted pediatric cataract surgery: Bochum formula. J Cataract Refract Surg. 2015;41(4):821–6. https://doi.org/10.1016/j.jcrs.2014.08.032 **The authors present an age-dependent correction formula (Bochum formula) to account for enlargement of the anterior capsulotomy relative to target size with femto-second laser.**
80. Fung SSM, Brookes J, Wilkins MR, Adams GGW. Mobile femtosecond laser platform for pediatric cataract surgery. Eur J Ophthalmol. 2018;28(2):246–50. https://doi.org/10.5301/ejo.5001055.
81.• Zhao YE, Gong XH, Zhu XN, Li HM, Tu MJ, Coursey TG, et al. Long-term outcomes of ciliary sulcus versus capsular bag fixation of intraocular lenses in children: an ultrasound biomicroscopy study. PLoS One. 2017;12(3):e0172979. https://doi.org/10.1371/journal.pone.0172979 **A retrospective study that used ultrasound biomicroscopy to assess the long-term outcomes of IOL fixation in the ciliary sulcus. This placement was found to increase IOL tilt and decentration, as well as crowd the anterior segment.**
82. Epley KD, Shainberg MJ, Lueder GT, Tychsen L. Pediatric secondary lens implantation in the absence of capsular support. Journal of American Association for Pediatric Ophthalmology and Strabismus. 2001;5(5):301–6. https://doi.org/10.1067/mpa.2001.117567.
83. Lin HT, Long EP, Chen JJ, Liu ZZ, Lin ZL, Cao QZ, et al. Timing and approaches in congenital cataract surgery: a four-year, two-layer randomized controlled trial. Int J Ophthalmol. 2017;10(12):1835–43. https://doi.org/10.18240/ijo.2017.12.08.
84. Elkin ZP, Piluek WJ, Fredrick DR. Revisiting secondary capsulotomy for posterior capsule management in pediatric cataract surgery. J AAPOS. 2016;20(6):506–10. https://doi.org/10.1016/j.jaapos.2016.06.011.
85. Batur M, Gul A, Seven E, Can E, Yasar T. Posterior capsular opacification in preschool- and school-age patients after pediatric cataract surgery without posterior capsulotomy. Turk J Ophthalmol. 2016;46(5):205–8. https://doi.org/10.4274/tjo.24650.
86. Koch DD, Kohnen T. A retrospective comparison of techniques to prevent secondary cataract formation following posterior chamber intraocular lens implantation in infants and children. Trans Am Ophthalmol Soc. 1997;95:351–60 discussion 61-5.
87. Trivedi RH, Wilson ME. Posterior capsule opacification in pediatric eyes with and without traumatic cataract. J Cataract Refract Surg. 2015;41(7):1461–4. https://doi.org/10.1016/j.jcrs.2014.10.034.
88. Kugelberg M, Kugelberg U, Bobrova N, Tronina S, Zetterstrom C. After-cataract in children having cataract surgery with or without anterior vitrectomy implanted with a single-piece AcrySof IOL. J Cataract Refract Surg. 2005;31(4):757–62. https://doi.org/10.1016/j.jcrs.2004.08.044.
89. Trivedi RH, Wilson ME Jr, Bartholomew LR, Lal G, Peterseim MM. Opacification of the visual axis after cataract surgery and single acrylic intraocular lens implantation in the first year of life. J AAPOS. 2004;8(2):156–64. https://doi.org/10.1016/S1091853103003197.
90. Bar-Sela SM, Har-Noy NB, Spierer A. Secondary membrane formation after cataract surgery with primary intraocular lens implantation in children. Int Ophthalmol. 2014;34(4):767–72. https://doi.org/10.1007/s10792-013-9873-9.
91. Hazirolan DO, Altiparmak UE, Aslan BS, Duman S. Vitrectorhexis versus forceps capsulorhexis for anterior and posterior capsulotomy in congenital cataract surgery. J Pediatr Ophthalmol Strabismus. 2009;46(2):104–7.
92. Kochgaway L, Biswas P, Paul A, Sinha S, Biswas R, Maity P, et al. Vitrectorhexis versus forceps posterior capsulorhexis in pediatric cataract surgery. Indian J Ophthalmol. 2013;61(7):361–4. https://doi.org/10.4103/0301-4738.101066.
93.• Rastogi A, Mishra M, Goel Y, Thacker P, Kamlesh. Comparative study of 25- versus 20-gauge pars plana capsulotomy and vitrectomy in pediatric cataract surgery. Int Ophthalmol. 2018;38(1):157–161. doi:https://doi.org/10.1007/s10792-016-0438-6. **This comparative study discusses outcomes following pars plana capsulotomy and vitrectomy using 25- and 20-gauge systems for pediatric cataract surgery.**

94.• Raina UK, Bhambhwani V, Gupta A, Bhushan G, Seth A, Ghosh B. Comparison of transcorneal and pars plana routes in pediatric cataract surgery in infants using a 25-gauge vitrectomy system. J Pediatr Ophthalmol Strabismus. 2016;53(2):105–12. https://doi.org/10.3928/01913913-20160208-01 **25-gauge posterior vitrectorhexis and anterior vitrectomy via a pars plana or transcorneal approach were compared at 1 year follow up.**
95. Matalia J, Anaspure H, Shetty BK, Matalia H. Intraoperative usefulness and postoperative results of the endoilluminator for performing primary posterior capsulectomy and anterior vitrectomy during pediatric cataract surgery. Eye (Lond). 2014;28(8): 1008–13. https://doi.org/10.1038/eye.2014.136.
96. Lotfy A, Abdelrahman A. Trypan blue-assisted posterior capsulorhexis in pediatric cataract surgery. Clin Ophthalmol. 2017;11:219–22. https://doi.org/10.2147/OPTH.S123150.
97. Tsai TH, Tsai CY, Huang JY, Hu FR. Outcomes of pediatric cataract surgery with triamcinolone-assisted vitrectomy. J Formos Med Assoc. 2017;116(12):940–5. https://doi.org/10.1016/j.jfma.2017.01.009.
98. Allam G, Ellakkany R, Ellayeh A, Mohsen T, Abouelkheir HE, Gaafar W. Outcome of pediatric cataract surgery with intraocular injection of triamcinolone acetonide: randomized controlled trial. Eur J Ophthalmol. 2018;1120672117754168:112067211775416. https://doi.org/10.1177/1120672117754168.
99.• Zhou HW, Zhou F. A meta-analysis on the clinical efficacy and safety of optic capture in pediatric cataract surgery. Int J Ophthalmol. 2016;9(4):590–6. https://doi.org/10.18240/ijo.2016.04.20 **A meta-analysis of 10 studies involving 282 eyes that demonstrated reduced visual axis opacification and IOL decentration with the optic capture technique.**
100.• Vasavada AR, Vasavada V, Shah SK, Trivedi RH, Vasavada VA, Vasavada SA, et al. Postoperative outcomes of intraocular lens implantation in the bag versus posterior optic capture in pediatric cataract surgery. J Cataract Refract Surg. 2017;43(9):1177–83. https://doi.org/10.1016/j.jcrs.2017.07.022 **This manuscript reports the findings of a prospective randomized trial involving 61 children comparing pediatric cataract surgery with IOL implantation in-the-bag and anterior vitrectomy to optic capture of the same IOL without anterior vitrectomy.**
101. Cicik ME, Dogan C, Bolukbasi S, Cinhuseyinoglu MN, Arslan OS. Comparison of two intraocular Lens implantation techniques in pediatric cataract surgery in terms of postoperative complications. Balkan Med J. 2018;35(2):186–90. https://doi.org/10.4274/balkanmedj.2017.1504.
102. Gradin D, Mundia D. Effect of intracameral cefuroxime on fibrinous uveitis after pediatric cataract surgery. J Pediatr Ophthalmol Strabismus. 2011;48(1):45–9. https://doi.org/10.3928/01913913-20100420-03.
103. Bowen RC, Zhou AX, Bondalapati S, Lawyer TW, Snow KB, Evans PR, et al. Comparative analysis of the safety and efficacy of intracameral cefuroxime, moxifloxacin and vancomycin at the end of cataract surgery: a meta-analysis. Br J Ophthalmol. 2018;102:1268–76. https://doi.org/10.1136/bjophthalmol-2017-311051.
104.• Gharaibeh AM, Mezer E, Ospina LH, Wygnanski-Jaffe T. Endophthalmitis following pediatric cataract surgery: an international pediatric ophthalmology and strabismus council global perspective. J Pediatr Ophthalmol Strabismus. 2018;55(1):23–9. https://doi.org/10.3928/01913913-20170823-02 **This manuscript summarizes the results of a survey distributed to American Association for Pediatric Ophthalmology and Strabismus members regarding their experiences with endophthalmitis following pediatric cataract surgery.**
105. Dixit NV, Shah SK, Vasavada V, Vasavada VA, Praveen MR, Vasavada AR, et al. Outcomes of cataract surgery and intraocular lens implantation with and without intracameral triamcinolone in pediatric eyes. J Cataract Refract Surg. 2010;36(9):1494–8. https://doi.org/10.1016/j.jcrs.2010.03.040.
106. Mataftsi A, Dabbagh A, Moore W, Nischal KK. Evaluation of whether intracameral dexamethasone predisposes to glaucoma after pediatric cataract surgery. J Cataract Refract Surg. 2012;38(10): 1719–23. https://doi.org/10.1016/j.jcrs.2012.05.034.
107.• Wilson ME, Lambert SR, Plager DA, VanderVeen D, Roarty J, O'Halloran H. Difluprednate versus prednisolone acetate for inflammation following cataract surgery in pediatric patients: a randomized safety and efficacy study. Eye (Lond). 2017;31(3):506–7. https://doi.org/10.1038/eye.2016.244 **A phase 3B multicentre, randomized trial comparing the safety and efficacy of postoperative regimens of difluprednate 0.05% to prednisolone 1%.**
108. Evereklioglu C, Ilhan O. Do non-steroidal anti-inflammatory drugs delay posterior capsule opacification after phacoemulsification in children? A randomized, prospective controlled trial. Curr Eye Res. 2011;36(12):1139–47. https://doi.org/10.3109/02713683.2011.609304.
109. Ventura MC, Ventura BV, Ventura CV, Ventura LO, Arantes TE, Nose W. Outcomes of congenital cataract surgery: intraoperative intracameral triamcinolone injection versus postoperative oral prednisolone. J Cataract Refract Surg. 2014;40(4):601–8. https://doi.org/10.1016/j.jcrs.2013.09.011.
110. Trivedi RH, Lambert SR, Lynn MJ, Wilson ME. Infant Aphakia treatment study G. the role of preoperative biometry in selecting initial contact lens power in the infant Aphakia treatment study. J AAPOS. 2014;18(3):251–4. https://doi.org/10.1016/j.jaapos.2014.01.012.
111. Trivedi RH, Wilson ME. Selection of an initial contact lens power for infantile cataract surgery without primary intraocular lens implantation. Ophthalmology. 2013;120(10):1973–6. https://doi.org/10.1016/j.ophtha.2013.03.013.
112. Russell B, Ward MA, Lynn M, Dubois L, Lambert SR. Infant Aphakia treatment study G. the infant aphakia treatment study contact lens experience: one-year outcomes. Eye Contact Lens. 2012;38(4):234–9. https://doi.org/10.1097/ICL.0b013e3182562dc0.
113.•• Lambert SR, Kraker RT, Pineles SL, Hutchinson AK, Wilson LB, Galvin JA, et al. Contact lens correction of Aphakia in children: a report by the American Academy of ophthalmology. Ophthalmology. 2018. https://doi.org/10.1016/j.ophtha.2018.03.014 **This report summarizes a literature review on the outcomes of silicone elastomer and rigid gas permeable contact lenses for the management of pediatric aphakia.**