Traumatic pediatric cataract: A decade of follow-up after Artisan® aphakia intraocular lens implantation

Marije L. Sminia, MD,[a] Monica Th.P. Odenthal, MD,[a,b] Liesbeth J.J.M. Wenniger-Prick, MD, PhD,[a] Nitza Gortzak-Moorstein, MD,[a] and Hennie J. Völker-Dieben, MD, PhD[c]

PURPOSE To describe the long-term clinical outcome of Artisan® aphakia intraocular lens (IOL; Ophtec, Groningen, The Netherlands) implantation in five aphakic eyes of five children, without capsular support, after cataract extraction following penetrating ocular trauma.

METHODS The charts of the five children were retrospectively reviewed. The data collected included follow-up time, nature of injury, age at cataract extraction and IOL implantation, visual outcome, endothelial cell counts, complications, and subsequent surgical interventions.

RESULTS Average follow-up was 11.0 years (range, 8.0-14.6 years). All eyes had a corneal perforation with various degrees of anterior segment injury. Mean patient age at lens extraction was 7.8 years (range, 5.6-10.2 years). Mean age at Artisan aphakia IOL implantation was 7.9 years (range, 5.7-10.2 years). The best spectacle–corrected visual acuity at last follow-up was 20/40 or better in four eyes. Mean endothelial cell loss compared with the healthy fellow eye was 40%. No patients experienced IOL dislocation, corneal decompensation, chronic anterior uveitis, cystoid macular edema, or iris atrophy. One eye had a retinal detachment 19 months after primary injury and needed vitreoretinal surgery.

CONCLUSIONS The Artisan aphakia IOL offers a useful alternative for correction of traumatic childhood aphakia. Although we only have results of a small number of patients, taking into account our long follow-up period, we feel that implantation of the Artisan aphakia IOL can be considered a treatment option in aphakic eyes of children that lack capsular support due to trauma. (J AAPOS 2004;xx:xxx)

When capsular support is absent in traumatic pediatric aphakia, treatment with contact lenses is often preferred.[1] However, long-term results and compliance with contact lens wear in children with unilateral traumatic aphakia are disappointing and, secondary intraocular lens (IOL) implantation, when contact lens wear is unsuccessful, has been described.[2,3] Furthermore, better binocular function seems to be achieved with IOLs when compared with contact lenses.[2,4] Anterior chamber IOLs, either angle-supported or iris-fixated, and scleral-fixated posterior chamber IOLs can be used in the absence of capsular support.

Several reports on groups of patients with angle-supported anterior chamber IOLs in traumatic pediatric aphakia have been published.[3,5-7] Due to the high incidence of secondary glaucoma, progressive pupil distortion, endothelial loss, and the limited experience with these IOLs in children, angle-supported IOLs have not gained widespread acceptance.

Scleral-fixated IOLs are considered a more acceptable alternative for in the bag or ciliary sulcus implantation of posterior chamber IOLs, in the absence of capsular support in children.[5,8,9] However, in scleral-fixated IOLs concerns have been raised about the risk of conjunctival and scleral erosion of scleral sutures leading to infection or endophthalmitis, IOL tilt, dislocation of the lens in the vitreous cavity, vitreous or ciliary body hemorrhage, and secondary glaucoma.[10-12]

We used the Artisan aphakia IOL (Ophtec, Groningen, The Netherlands),* a PMMA anterior chamber iris-fixated

Author affiliations: [a]*Department of Ophthalmology, Academic Medical Centre, Amsterdam, The Netherlands;* [b]*Department of Ophthalmology, Diaconessenhuis, Leiden, The Netherlands; and* [c]*Department of Ophthalmology, Vrije Universiteit Medical Centre, Amsterdam, The Netherlands.*

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Reprint requests: Marije L. Sminia, Academic Medical Centre, Department of Ophthalmology, Room D2-146, Meibergdreef 9, 1105 AZ, Amsterdam, The Netherlands (email: m.l.sminia@amc.uva.nl).

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*Ophtec BV manufactures and distributes the lens under the trade name ARTISAN® in all markets except North America and Japan. AMO is the exclusive source for the product in North America and Japan, which it markets under the Verisyse™ brand. The US FDA has not approved the aphakic ARTISAN/Verisyse lens.

Table 1. Characteristics

Patient	Sex	Eye	Type of injury	Length of corneal scar (mm)	Age at CE (yr)	Interval between CE and IOL implantation (mo)	Follow-up period after IOL implantation (yr)
1	F	OD	Skewer	Unknown	6.8	0	12.2
2	M	OS	Arrow	8.0	5.6	1	14.6
3	M	OS	Copper wire	Unknown	7.5	0	11.9
4	M	OS	Glass splinter	3.2	8.7	9	8.5
5	F	OD	Fire cracker	7.0	10.2	0	8.0
Mean					7.8	4.5	11.0

CE, cataract extraction; *IOL*, intraocular lens.

lens originally designed in 1978 by J G. Worst, Groningen, The Netherlands. Four reports on successful implantation of this IOL for various indications in children can be found in the literature, all with a short follow-up.[13-16] Previous authors emphasize the need for long-term follow-up of Artisan IOLs in children.

We present a series with long-term follow-up of the Artisan aphakia IOL in five eyes of five children for aphakia secondary to the extraction of traumatic cataract. The aim of this study was to retrospectively evaluate the long-term clinical outcome of Artisan aphakia IOL implantation in these patients. To our knowledge, this is the first publication with a mean follow-up of more than 10 years after Artisan aphakia IOL implantation in children.

Subjects and Methods

We performed a retrospective review of the records of all five children who underwent cataract extraction and unilateral Artisan IOL implantation between 1987 and 1997. All cataracts resulted from penetrating ocular trauma.

The nature of injury, the age of the patients at cataract extraction and IOL implantation, the visual outcome, the complications, and the subsequent surgical interventions were retrospectively evaluated. Photographs of the corneal endothelium were obtained at the last follow-up visit in three of five patients (Cases 2, 4, and 5). A noncontact auto-focus specular microscope (Topcon Corporation, Tokyo, Japan) was used. The endothelial cell counts of the operated traumatic eye were compared with the endothelial cell counts of the healthy fellow eye. We presumed that the endothelial cell counts of the two eyes of one person are equal (100%) when there is no history of any surgery or trauma. The number of endothelial cells in the operated traumatic eye was divided by the number of endothelial cells in the healthy fellow eye and subtracted from 100% to obtain the estimated percentage of cell loss of the operated eye compared with the healthy fellow eye.

All implantation procedures were performed by one of the authors (NGM) under general anesthesia. In three eyes a primary implantation was performed and in two eyes a secondary implantation was performed (Table 1).

In the case of primary implantation the traumatic corneal perforation was closed with interrupted 10.0 nylon sutures. The cataract was removed using irrigation and aspiration, through a limbal corneoscleral incision. Intraocular miotics were administered and the Artisan aphakia IOL was inserted after enlargement of the corneoscleral incision to 5 mm. In the case of secondary implantation miotic drops were administered preoperatively. The Artisan aphakia IOL was inserted through a 5 mm limbal corneoscleral incision.

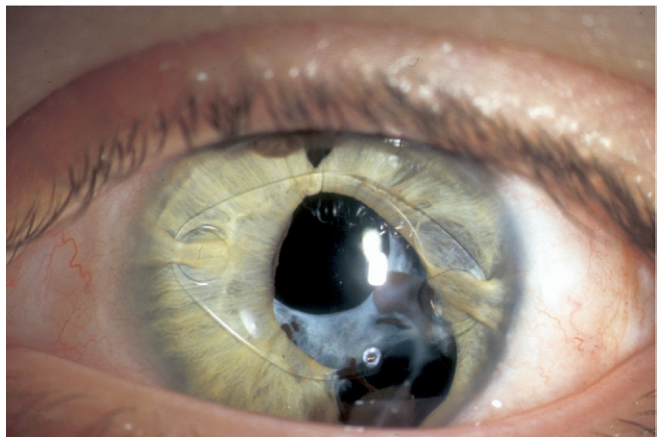

FIG 1. Example of the Artisan aphakia IOL in Patient 2.

In both procedures a special forceps (Ophtec) or a bent needle was used to enclavate the iris in the claws of the lens. Two paracenteses were made for this purpose.

Healon® (Pharmacia, Uppsala, Sweden) was used to protect the corneal endothelium in all cases. An iridectomy was made in all eyes to prevent pupillary block. The incision was closed with interrupted 10.0 nylon sutures. Routinely subconjunctival antibiotics and steroids were given. Postoperatively all patients received topical steroids, antibiotics, and mydriatics, for 4 to 8 weeks.

A 5 mm optic Artisan aphakia IOL with a total diameter of 8.5 mm was implanted (Figure 1). The IOL power was calculated using the method published by Binkhorst and van de Heijde in 1976[17,18] using ultrasound A-scan and keratometry of the traumatic eye and fellow eye. The target refraction and the power of the implanted IOLs can be found in Table 2.

Results

Information on age, gender, cause of injury, and laterality is presented in Table 1. The mean follow-up period was 11.0 years (range, 8.0-14.6 years).

Information on visual acuity and refraction can be found in Table 2.

A cosmetically apparent strabismus was not observed in any of the children. Four of five patients (80%) (Cases 1,

Table 2. Clinical results

Patient	IOL power (D)	Postoperative refraction aim (SE)	SE 2 months postoperative (D)	Final SE (D)	BSCVA Traumatic eye at last follow-up	Complications	Other procedures
1	+19.5	Unknown	+2.0	Emmetropia	20/16	Fibrinous uveitis	No
2	+21.0	0	−1.0	−3.5	20/100	Retinal detachment	Vitreoretinal surgery
3	+23.0	+1.5	−2.0	−5.0	20/30	No	No
4	+20.0	−1.5	−0.5	−6.5	20/40	Vitreous strand to incision	ndYAG laser
5	+21.0	+1.0	−1.0	−2.5	20/40	Fibrinous uveitis	No

BSCVA, best spectacle-corrected visual acuity.

Table 3. Endothelial cell counts

Patient	Endothelial cell count operated eye (cells/mm^2)	Endothelial cell count fellow eye (cells/mm^2)	Cell loss operated eye compared to fellow eye (%)	Follow-up (yr)
1	Not available	—	—	N/A
2	1.620	2.872	44	14.6
3	Not available	—	—	N/A
4	1.349	2.881	53	8.5
5	1.972	2.542	22	8.0
Mean	1.647	2.765	40	10.4

2, 3, and 4) demonstrated binocular single visual acuity, tested with plate IV of the TNO test. In one patient (Case 5) stereopsis was not tested.

One patient (Case 3) complained of diplopia 1 month after secondary Artisan aphakia IOL implantation due to a sensory intermittent esotropia. This was successfully treated with temporary prisms. After discontinuation of prisms, binocular single visual acuity was still present.

Table 3 provides details on the endothelial cell counts.

No major intraoperative or postsurgery complications occurred. No eyes were lost and all eyes achieved a visual acuity of at least 20/100.

In three patients minor postoperative complications occurred. Short-term fibrinous uveitis was noted in two eyes (Cases 1 and 5) in the first postoperative month, successfully treated with topical steroids. One eye (Case 4) had a vitreous strand in the anterior chamber that was severed using NdYAG laser several months after surgery.

One of five patients (Case 2) developed a retinal detachment 18 months after Artisan aphakia IOL implantation, 19 months after the initial trauma, which included a corneal laceration of 8 mm, a partial traumatic aniridia, and a choroidal rupture. This eye underwent four vitreoretinal procedures in the two following years to attach the retina. Nevertheless the final best-corrected visual acuity was 20/100 (Table 2).

Discussion

In the absence of capsular support, several options are available for the surgical correction of traumatic aphakia. One of these is the implantation of the Artisan aphakia IOL. Despite more than 10 years of favorable clinical experience with this IOL in the Netherlands and elsewhere, very few studies on the use of the Artisan IOL in adults or children for this indication have been published. We report the long-term outcome of this IOL in a pediatric age group.

Possible causes of concern in anterior chamber IOLs are dislocation, corneal decompensation, chronic anterior uveitis, cystoid macular edema, and iris atrophy. We did not encounter any of these complications after a mean of 11.0 years follow-up.

In 1996 van der Pol and Worst[16] described the results of Artisan aphakia IOL implantation in 38 eyes of aphakic children due to cataract of various origins. The IOLs were implanted in the period from 1980 to 1992. The follow-up period was not reported. Worst observed a relatively high rate of lens dislocations, which he attributed to the rigid claws in the older lens design. The manufacturer solved this problem during the mid-1980s. In our study, using the improved lens design, IOL dislocation was not observed.

Visual acuity in four of five eyes in our study ranged from 20/40 to 20/16. Kumar et al[10] report in their study a subgroup of eight eyes with traumatic cataract and scleral-fixated IOL implantation. Visual acuity ranged from 20/80 to 20/20. This is in accordance with our findings. However in their study suture erosion occurred in two cases, cystoid macular edema in two cases, and glaucoma in one case. These are well-known complications in scleral-fixated IOLs. None of these complications was observed in our patients.

No corneal edema was found in our patients. The eyes with an Artisan IOL showed a substantially lower endothelial cell count compared with the healthy fellow eye. The mean endothelial cell loss, compared with the fellow eye, in our patients was 40%. Kora et al[19] found a mean cell loss of 44% in five eyes of five children with traumatic cataract, mean age 9.9 years, with a mean follow-up of 6.8 years after implantation of a posterior chamber IOL. We reported earlier on endothelial cell counts in six eyes of children with traumatic cataract that were compared with endothelial cell counts of three eyes of children with congenital cataract. The substantial cell loss in eyes after surgery for traumatic cataract seems to be primarily caused by damage due to the perforating trauma and not by the presence of the Artisan aphakia IOL.[20] Three of the six patients with traumatic cataract (Cases 2, 4, and 5; only

those children who received a standard Artisan IOL model and not a custom made model) are included in this present study.

Photographs of the endothelium were obtained at last follow-up in this present study. Serial cell counts were not available. For further studies on the Artisan aphakia IOL we recommend serial endothelial cell counts to detect possible progressive cell loss.

Anterior segment trauma is accompanied by considerable damage and endothelial cell loss as reported previously. The need for long-term follow-up of the Artisan IOL in children, as stressed by various authors, has been addressed by our study. Our long-term results in five patients show that the Artisan aphakia IOL can be a useful alternative in the repair of pediatric traumatic aphakia and can be considered a treatment option in aphakic eyes of children that lack capsular support due to trauma.

Literature Search

We performed a Medline search on the terms *pediatric cataract*, *traumatic cataract*, *IOL*, and *anterior segment ocular trauma* (limits: English language).

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