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ARAŞTIRMA / RESEARCH

Surgical approach to pediatric traumatic cataract

Pediatrik travmatik kataraktta cerrahi yaklaşım

Emine Çiloglu[1], Fikret Ünal[1]

[1]Adana Training and Research City Hospital, Department of Ophthalmology, Adana, Turkey.

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Abstract

Purpose: The aim of this study was o evaluate our surgical approach in children who were operated due to traumatic cataract in our clinic.

Material and Methods: By using anterior vitrector, lensectomy was performed in pediatric patients who have traumatic cataract. The patients who have capsular support, the intraocular lens (IOL) was implanted in the capsular bag or in the sulcus and who do not have capsule support the IOL was implanted with sutureless intrascleral fixation method.

Results: 21 eyes of 21 patients were included in the study. The mean age of the cases was 8.7±3.5 years. All of the cases had penetran injuries, and performed corneal suturation before due to the corneal perforation. Lensectomy was performed by using anterior vitrectomy probe in all patients. ln two patients, monoblock foldable IOL were implanted in the capsular bag, in 12 patients three-piece foldable IOL were implanted in the sulcus and in 4 patients three-piece foldable lens were implanted with intrascleral fixation. The combination of pars plana vitrectomy-lensectomy and three-piece foldable IOL implantation with intrascleral fixation were done in three patients because of retinal problem. Scleral tunnel was preferred to corneal tunnel for implantation of IOL.

Conclusion: Lens capsule integrity was usually impaired in traumatic cataract cases. It may be not possible to do capsulorrhexis in these cases. Vitreous and fibrotic membrane are usually found in anterior chamber in these cases. It is considered that it is more appropriate to do lensectomy by using anterior vitrectomy probe instead of standard cataract surgery.

Key words: traumatic cataract, anterior vitrectomy, aphakia, sutureless intrascleral fixation

Öz

Amaç: Bu çalışmada kliniğimizde travmatik katarakta bağlı opere olan çocuklarda cerrahi yaklaşımımızı bildirmek amaçlanmıştır.

Gereç ve Yöntem: Travmatik kataraktı olan çocuk hastalarda ön vitrektor kullanılarak lensektomi yapıldı. Kapsül desteği olanlar hastalarda göz içi lens (GİL) bag içine veya sulkusa, kapsül desteği olmayanlarda GİL sütürsüz skleral fiksasyon metoduyla yerleştirildi.

Bulgular: Yirmi bir hastanın 21 gözü çalışmaya dahil edildi. Ortalama yaş 8.7±3.5 yıl idi. Tüm hastalarda penetran yaralanma mevcuttu ve korneal perforasyon nedeniyle öncesinde korneal sütürasyon yapılmıştı. Tüm hastalarda ön vitrektomi probu kullanılarak lensektomi yapıldı. 2 hastada tek parça GİL bag içine, 12 hastada 3 parçalı lens sulkusa, 4 hastada 3 parçalı lens skleral fiksasyon yöntemi ile yerleştirildi. 3 hastada retinal problem nedeniyle kombine pars plana vitrektomi-lensektomi ve skleral fiksayon metodu uygulandı. GİL implantasyonu için korneal tünel yerine skleral tünel tercih edildi.

Sonuç: Travmatik katarakt olgularında lens kapsül bütünlüğü çoğunlukla bozulmuştur. Bu vakalarda kapsuloreksiz yapmak mümkün olmayabilir. Yine bu vakalarda ön kamarada genellikle vitreus ve fibrotik membranlar mevcuttur. Bu nedenle standart katarakt cerrahisi yerine ön vitrektomi probu kullanılarak lensektomi yapmanın daha uygun olduğu düşünülmektedir.

Anahtar kelimeler: travmatik katarakt, ön vitrektomi, afaki, sütürsüz intraskleral fiksasyon

Yazışma Adresi/Address for Correspondence: Dr. Emine Çiloğlu, Adana Training and Research City Hospital, Department of Ophthalmology, Adana, Turkey. e-mail: drciloglu@gmail.com
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INTRODUCTION

Traumatic cataract which constitute 29-57 % of pediatric cataract is one of the main causes of unilateral blindness in children. If it is not treated on time and effectively, it can result in visual impairment, loss of binocular vision, amblyopia, strabismus and blindness[1,2].

Various methods are used to correct the aphakia following cataract surgery. In children as in adults, the location of an ideal intraocular lens (IOL) implantation is in the capsular bag. However, when it is not possible in case of inadequate posterior capsule support, for visual rehabilitation, IOL implantation can be applied to sulcus or anterior chamber. Also scleral fixated posterior chamber or iris-fixated posterior chamber lenses can be used. In the traumatic cataract, the integrity of the anterior capsule is usually disturbed and vitreus is usually present in the anterior chamber. Fibrin reaction, membranes, synechiae are frequently encountered in travmatize eyes especially in children. They may cause difficulty during the formation of capsulorrhexis. It is very important to terminate the surgery with minimal intervention without excessive trauma.

The aim of this study is to evaluate the reason and results of the surgical method applied to the pediatric group under 18 years old developing traumatic cataract for different reasons.

MATERIALS AND METHODS

The patients under 18 years old operated for traumatic cataract in our clinic between January 2013 and February 2015 were included in the study. The study was approved by the Ethics Committee of Adana Numune Training and Research Hospital and performed in accordance with ethical standarts of the Helsinki Declaration. A informed consent was taken from the parents of children.

The etiology, intraocular pressure (IOP) value with non-contact tonometer, anterior and posterior segment examination, the localization of IOL implantation and developing complications of the patient were recorded. IOL power was estimated according to biometric measurements (axial length and keratometry) using the SRK II formula. When it was not possible to obtain such measurements, fellow eye refraction was used to help determine the required IOL power. The measurement of the children under six years old was performed under general anesthesia. All patients were operated under general anesthesia.

Surgical procedure

In the eyes not requiring pars plana vitrectomy (PPV), surgical procedure is used. As a surgical technique; following conjunctival peritomy, 3.2 mm lenght scleral tunnel 2 mm from the limbus was made. Corneal side entrances were made at 2 and 10 o'clock position. Adrenaline was given to the anterior chamber. Anterior capsule was made visible by administering trypan blue. By using anterior vitrectomy probe capsulotomy and lensectomy was performed through the corneal side ports. The capsular opening was widened to be circular rather than elliptic, to make the capsular edges invisible through the pupil. Simultaneously, vitreous cleaning was done if there was vitreus in the anterior chamber. In the presence of capsular support, monoblock foldable IOL was placed in the capsular bag or three-piece foldable IOL was placed in the sulcus.

In cases who do not have posterior capsular support; sutureless intrascleral fixation method with three-piece foldable IOL was performed. The peripheral cornea was marked with tissue pen at two points 180° from each others. After peritomies are done, two 3 mm scleral tunnels are created 1.5 mm from and parallel to the limbus at the 3 and 9 o'clock positions with 23 gauge microvitreoretinal (MVR) knife. A 25-gauge needle (like insulin needle) was done 60° angled. It is used to grasp, secure and subsequently externalize one haptic at a time through the appropriate sclerotomy. Viscoelastic is injected into the anterior chamber. A 25–gauge needle is inserted at the end of one intrascleral tunnel, directed into the mid-vitreus cavity. While the three-piece foldable IOL was injecting into the eye through the scleral tunnel, the haptic of the IOL is inserted into the hollow needle. All secondary IOLs used were Alcon (Alcon Laboratories Inc., Fort Worth, TX) MA60AC three-piece intraocular lenses. The haptic is removed out by withdrawing the needle and cautherized the tips of the haptic and then inserted into the scleral tunnel. The same procedure was performed for the other haptic. After the injected viscoelastic into the anterior chamber, 25 gauge needle held in the right hand, the haptic tip

was grasped with the forceps, pushed through the needle hollow and externalized with the needle on the right side. The haptics were then properly placed into the scleral tunnel by pushing their tips. Viscoelastic was cleaned from the eye. Corneal side port incision was closed with stromal hydration or 10/0 nylon suture. The conjunctiva is then closed with 8/0 vicryl.

In the eyes requiring PPV, after PPV the same procedure was done as describe above. The operation was terminated by injecting subconjunctival gentamicin and deksametazon. The postoperative treatment protocol included a combination of antibiotic and steroid drops 5 times daily, which was slowly tapered down over the first 5 postoperative weeks. Treatment with atropine 1% (Alcon, Fort Worth, TX) was added if a fibrinous reaction was noted in the anterior chamber.

Statistical analysis

SPSS 21.0 was used for statistical analysis. All results have been presented as mean±standard deviation (SD).

RESULTS

21 eyes of 21 patients were included in the study. The mean age of the cases was 8.7 ± 3.5 (3-15) years. 15 of the cases (71%) were male and 6 of the cases (29%) were female. All of the injuries were penetrant injuries accompanied by corneal perforation. The main causes were sharp metal objects (scissors, knives, needles)(56.2%), toys (24.8%), wooden sticks (18%). Due to the corneal perforation, corneal suturation was made an average of 12 ±2.5 days (7-21 days) before cataract surgery. Lensectomy was performed in 21 eyes of 21 patients by using anterior vitrectomy probe. Scleral tunnel was preferred to corneal tunnel for the IOL implantation.

In 2 patients, monoblock foldable IOL were implanted in the capsular bag, in 12 patients three-piece hydrophobic acrylic foldable IOL were implanted in the sulcus and in 4 patients three-piece hydrophobic acrylic foldable lens were implanted with sutureless intrascleral fixation method.

The combination of pars plana vitrectomy-lensectomy and three-piece foldable IOL implantation with intrascleral fixation was done in three patients because of intraocular foreign body and vitreous hemorrhage in 2 patients, and retinal detachment in 1 patient (Table 1). The patients were followed 30±12.3 months.

As a complication, spontaneously regressive fibrin reaction in 8 patients (38%), hyphema in 2 cases (9.5%) and corneal abscess in 1 case (4.7%) developed. IOL dislocation, tilted IOL and haptic exposure were not encountered in any of the cases. In any case, elevation of intraocular pressure or glaucoma developed.

At presentation; visual acuity was between 20/2500-20/1250 according to Snellen chart in 19 patients. In 2 patients visual acuity couldn't be assessed because of small age. At follow-up visits; visual acuity of >20/63 was achieved in 51.3%,78.4%,68.2% of cases at one month,6 months and 30 months, respectively, where as visual acuity of >20/200 was achieved in 88.1%, 91%, 95.3 % patient respectively.

Posterior capsular opacification developed in 2 patients (9.5%). One of these underwent surgical capsulotomy and the other patient underwent Nd-YAG capsulotomy. In follow-up; amblyopia developed in 8 patients. When we group the patients by age; Group A (1-5 years), Group B (5-10 years), Group C (more than 10 years), amblyopia was found in 3 of 3 patients in Group A, in 4 of 10 patients İN Group B and in 1 of 8 patients in Group C. In one patient squint (exotropia) developed secondary to deep amblyopia.

DISCUSSION

Traumatic cataract is a common complication of an eye injury. In traumatic cataract, approach and timing of surgery vary with the location and shape of the lens opacity, visual acuity, IOP and intraocular inflammation. In unilateral traumatic cataract at the age of amblyopia, it is necessary to obtain a clear vision and to solve the afaki properly.

The management of traumatic cataract has been seen as a complex process due to surgical timing, detecting keratometry values and axial length, the presence of insufficient capsule support, difficulties in IOL placement [3].

Table 1. Clinical findings and managements of the patients

No	Gender	Age	Clinical findings	Management
1	F	4	Corneal suturation, Traumatic cataract, Sekluzyo pupil	Lensectomy, Synechiaetomy Anterior vitrectomy, IOL implantation in sulcus
2	M	9	Corneal suturation, Traumatic cataract	Lensectomy, IOL implantation in the sulcus
3	M	10	Corneal suturation, Traumatic cataract, Posterior synechiae	Lensectomy, Synechiaetomy, Anterior vitrectomy, intrascleral fixation
4	M	8	Corneal suturation, Traumatic cataract Vitreous in the anterior chamber, Lens subluxation	Lensectomy, IOL implantation in capsular bag
5	M	15	Corneal suturation, Traumatic cataract Vitreous in the anterior chamber, lens luxation	Lensectomy, anterior vitrectomy, intrascleral fixation
6	M	14	Corneal suturation, Traumatic cataract Vitreous in the anterior chamber, Vitreus hemorrhage	Pars plana lensectomy, Vitrectomy, intrascleral fixation
7	M	5	Corneal suturation, Traumatic cataract, Vitreous in the anterior chamber, Pupillary membrane	Lensectomy, anterior vitrectomy, intrascleral fixation
8	M	15	Corneal suturation, Traumatic cataract, Retinal detachmentı, Intraocular foreign body	Lensectomy, Pars plana vitrectomy, intrascleral fixation
9	F	3	Corneal suturation, Traumatic cataract Pupillary membrane	Lensectomy, anterior vitrectomy, IOL implantation in the sulcus
10	M	6	Corneal suturation, Traumatic cataract	Lensectomy, IOL implantation in capsular bag.
11	M	7	Corneal suturation, Traumatic cataract, Viterous in the anterior chamber, vitreus hemorrhage	Pars plana lensectomy- vitrectomy, Intrascleral fixation
12	F	10	Corneal suturation, Traumatic cataract, Vitreous in the anterior chamber	Lensectomy, anterior vitrectomy, IOL implantation in the sulcus
13	F	6	Corneal suturation, Traumatic cataract, Posterior synechiae	Lensectomy, synechiaetomy, anterior vitrectomy, IOL implantation in the sulcus
14	M	11	Corneal suturation, Traumatic cataract, Posterior synechiae	Lensectomy, anterior vitrectomy, IOL implantation in the sulcus
15	M	9	Corneal suturation, Traumatic cataract, Iris defects, zonular damage	Lensectomy, anterior vitrectomy, IOL implantation in the sulcus
16	M	10	Corneal suturation, Traumatic cataract, Vitreous in anterior chamber	Lensectomy, anterior vitrectomy, intrascleral fixation
17	F	8	Corneal suturation, Traumatic cataract	Lensectomy, IOL implantation in the sulcus
18	F	9	Corneal suturation, Traumatic cataract, Posterior synechiae	Lensectomy, anterior vitrectomy, IOL implantation in the sulcus
19	M	7	Corneal suturation, Traumatic cataract, Vitreous in anterior chamber	Lensectomy, anterior vitrectomy, IOL implantation in the sulcus
20	M	10	Corneal suturation, Traumatic cataract	Lensectomy, anterior vitrectomy, IOL implantation in the sulcus
21	M	8	Corneal suturation, Traumatic cataract, Posterior synechiae	Lensectomy, synechiaetomy, IOL implantation in the sulcus

M: male, F: female; IOL: intraocular lens

Integrity of the anterior capsule can be mostly distrupted in traumatic cataract and it causes difficulty for making capsularhexis. Especially in children it is associated with increased inflammation. Also anterior and posterior synechiae, fibrotic membrans are frequently seen. Differently from the standard cataract surgery, at the traumatic cataract of pediatric age group, it is possible to do both capsularhexis and lensectomy, also if needed anterior vitrectomy, with only one device by vitrector instead of performing capsularhexis with ultrata and performing lensectomy with irrigation aspiration. It is avoided to use more tools and unnecessary manipulations with this procedure to prevent more inflammation. Capsulorhexis can be made in sufficient width and easily done by vitrector.

In cataract surgery of the children, scleral tunnel 1,5 mm from the limbus is usually done due to the elasticity of sclera. This procedure causes less astigmatism and also decreases iris prolapse. Therefore, we performed lensectomy, anterior vitrectomy through the corneal side port and IOL implantation through the scleral tunnel in all of our cases.

IOL provide a better retinal images than contact lenses and glasses during the childhood that visual development is very fast. IOL replacement in capsule is considered as a safe procedure in children as well as adults [4]. Without adequate capsular support, the surgical management of aphakia is often challenging. To date, no optimal surgical approach is available to overcome this problem. However, anterior chamber IOLs, iris or scleral sutured posterior chamber IOL and iris claw IOL can be used.

In scleral fixation method, the lens is implanted anatomically and functionally in the most suitable place due to its proximity to the nodal point increases visual quality and degree compared to aphakic glasses [5]. Jacobi and et al provided 91% visual increase in 14 patients' visual acuity due to their monofocal scleral fixation of posterior chamber IOL [6]. Kugu and et al provided two lines and more visual increase with snellen chart by applying scleral fixation and posterior chamber IOL to 60% of 10 eyes of 6 children [7]. There are similar studies in the literature [8-10]. Sewelam has pointed out that amblyopia is the main reason of the lack of increase in the level of vision in IOL implantation performed in pediatric patients with scleral fixation [11]. In our study, we determined increased visual acuity levels mostly, but similarly, amblyopia and complications are the main reasons of the children whose visual acuity do not increase or slightly increase.

The reported complications of the posterior chamber lens with scleral fixation are retinal detachment (2.6%), IOL tilted or dislocation(2.6%), corneal edema (3.4%), cystoid macular edema (5.9%), secondary glaucoma (1.7%) and endophthalmitis (0.9%)[12]. We performed sutureless intrascleral fixation in 7 patients and didn't observed like these complications.

Buckley conducted a study of effectiveness, reliability and suitability in a long period of IOL implantation performed with scleral fixation in pediatric patients. A serious complication was not found association with intraoperative and immediate postoperative in studied 33 eyes. In 3 patients, spontaneous IOL subluxation was observed in a long period. A rupture of one of two haptic of 10-0 polypropylene suture was detected in these cases after 3,5,8 and 9 years respectively. In this study, it was concluded that IOL implantation performed in pediatric patients with scleral fixation in a long period was effective and safe surgery [13]. Asadi and et al reported that in a study with IOL implantation performed in 25 pediatric eyes with scleral fixation, the most common and long-term striking complication is IOL dislocation due to polypropylene suture rupture in 6 eyes after 7-10 years [14]. As seen, complications due to suture such as suture exposure and suture erosion can develop in IOL implantation with scleral fixation. Considering these studies, it is likely to say that the method of sutureless intrascleral fixation of a three-piece lens that we performed in our study is effective and reliable for a long-term.

In our study, we detected amblyopia in 8 patients, one of them was deep amblyopia. We found that the incidence of amblyopia in the younger age group was higher.

After cataract surgery, fibrinous uveitis is the early postoperative complication, which is frequently reported and especially encountered in the pediatric age group and leading to membrane formation in pupil range, pupillary block glaucoma and posterior synechias [15-18]. Incidence of these complications are much more likely in traumatic cataract associated with the deterioration of the integrity of the ocular

tissue structures. Also, in our study the most common complication was fibrinous uveitis. However, this inflammatory condition regressed three weeks with topical steroid drops in all of the cases.

There is no standard surgical technique to be applied to the cases with traumatic cataract. In these cases, each of whom can show different feature, the surgery which will be applied and IOL which will be placed should be detected according to anatomical changes occurring in the traumatic eye. The presence of corneal scar, irregular astigmatism, pupil irregularities, retinal scar and amblyopia limit the increase in visual acuity. The aim must be the best visual results with minimal damage. We want to emphasize in this study, that it is more appropriate to do lensectomy by using anterior vitrector instead of standard cataract surgery in cases who have vitreous and fibrotic membrane in the anterior chamber and the deterioration integrity of the lens capsule. Using scleral tunnel instead of corneal tunnel can be helpful to reduce astigmatism. In patients planned to perform scleral fixation, performing the process of sutureless intrascleral lens implantation provides a protection against prospective complications due to the suture.

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