CODEN [USA]: IAJPBB ISSN: 2349-7750

INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES

http://doi.org/10.5281/zenodo.3359922

Available online at: http://www.iajps.com ***Research Article***

MANAGEMENT OF ANTERIOR CAPSULE IN CONGENITAL CATARACT WITH AUTOMATED VITRECTOMY CUTTER (VITRECTORHEXIS)

[1]Dr. Muhammad Khalid, [2]Dr. Muhammad Jahan zaib Khan, [3]Dr. Muhammad Rizwan

[1]Associate Professor, Department of Ophthalmology, Quaid-e-Azam Medical College, Bahawalpur., [2]Assistant Professor, Department of Ophthalmology, Quaid-e-Azam Medical College, Bahawalpur. [3]Assistant Professor, Sahiwal Medical College Sahiwal.

Article Received: June 2019 **Accepted:** July 2019 **Published:** August 2019

Abstract:

To evaluate the clinical efficacy and technique of vitrectorhexis in terms of anterior capsulotomy in children with congenital cataract.

Material and Methods: This Prospective, Non-comparative, Interventional study was conducted from July 2018 to April 2019 at Pediatric Eye Operation Theater, Ophthalmology Department, Bahawal Victoria Hospital, Bahawalpur. Total 30 eyes were included in this study.

Results: In our series, the age range was 0-8 years and the mean age was 2.97±3.08 years, 60% (n=18) were male and 40% (n=12) were female, frequency of clinical efficacy was recorded in 83.33% (n=25) while 16.67% (n=5) were not treated effectively (as per operational definition). Complications of vitrectorhexis revealed 13.33% (n=4) radial tear during performing anterior vitrectorhexis, 3.33% (n=1) radial tear during IOL implantation, 3.33% (n=1) conversion of anterior vitrectorhexis, 3.33% (n=1) small sized anterior vitrectorhexis and 3.33% (n=1). IOL implanted in ciliary sulcus while no patient was recorded with radial tear during irrigation/aspiration of lens matter, radial tear during removal of viscoelastic substance, IOL decentration and failure to implant IOL.

Conclusion: Vitrectorhexis is well suited method of anterior capulotomy in children with congenital cataract below 6 years of age.

Keywords: *Congenital cataract, children, capsulotomy, vitrectorhexis, clinical efficacy*

Corresponding author:

Dr. Muhammad Khalid,

Associate Professor, Department of Ophthalmology, Quaid-e-Azam Medical College, Bahawalpur.

QR code

Please cite this article in press Muhammad Khalid et al., ***Management Of Anterior Capsule In Congenital Cataract With Automated Vitrectomy Cutter (Vitrectorhexis).,*** *Indo Am. J. P. Sci, 2019; 06(08).*

INTRODUCTION:

Despite recent advances in microsurgical techniques, pediatric cataract surgery remains a challenging issue. The problems inherent in the treatment of pediatric cataracts are related to surgical technique. Experience in this field, as well as awareness of the differences between pediatric and adult cataract surgery is the cornerstone for achieving successful results.

The use of the vitrectomy cutter had been reported as part of the "lensectomy" approach to pediatric cataracts as early as 1981.In 1994, Wilson performed anterior capsulotomy with vitrectomy cutter in congenital cataract surgery. More recently, the 2003 pediatric cataract practice pattern survey showed that vitrectorhexis is now the most commonly used anterior capsulotomy technique for pediatric cataract surgery during the early years of life around the world. As the child gets older, the manual CCC technique becomes somewhat easier to complete and control.

CLINICAL EFFICACY:

The clinical efficacy of anterior capsulotomy with automated vitrectomy cutter was in terms of centralization of vitrectorhexis, adequate in size, smooth regular edges, no radial tear, completed with vitrectomy cutter without conversion, IOL implantation and centration in capsular bag or planned aphakia.

MATERIAL AND METHODS:

This Prospective, Non-comparative, Interventional study was conducted from July 2018 to April 2019 at Pediatric Eye Operation Theater, Ophthalmology Department, Bahawal Victoria Hospital, Bahawalpur. 30 eyes were included in this study.

Inclusion criteria:

- Patient with congenital cataract
- Patient age below 8 years
- Clear cornea

Exclusion criteria:

- Traumatic cataract.
- Age above 8 years where Nd-YAG laser capsulotomy can be done.
- Persistence fetal vasculature.
- Congenital glaucoma.
- Calcified capsule.
- Partially absorbed cataract with thick and fibrotic capsule.
- Uveitis especially chronic juvenile rheumatoid arthritis.
- Previous ocular surgery.
- Corneal opacity, band keratopathy, congenital corneal dystrophy.
- Retinal detachment.
- Small pupil.
- Visually insignificant cataract.

A detailed history was taken including name, age, sex, occupation, address, diagnosis, brief history of illness, history of previous surgery, history of any previous disease and trauma. A history of medication, skin rashes and drug allergies during pregnancy was also taken. Visual acuity was assessed by using fixation and following, preferential looking and fixation behavior.

Nystagmus, strabismus and central fixation behavior was noted.

Detailed examination of anterior segment of both eyes was done with portable slit-lamp. Pupil size and reaction to light was checked. Intraocular pressure of both eyes was checked using hand held Perkins tonometer.

B scan of both eyes was performed to rule out any ocular abnormality when cataract was so dense that fundus examination was not possible.

After briefing the merits and demerits of the treatment to the parents of the patients, a formal informed consent was taken. All surgeries were performed by author under general anesthesia.

SURGICAL TECHNIQUE:

A separate limbal entry wound for vitreous cutter was made. The anterior capsule was stained with tryphane-blue for adequate visualization. Anterior chamber maintainer was introduced through a side port at the temporal side of the limbus. Vitrectorhexis was performed using Storz Protégé DPX 100 vitrectomy Venturi pump at a cutting rate of 150 cuts per minute with high infusion rate and fluid setting of 50 mmHg with 20 G (gauge) or 23 G (gauge) automated vitrectomy cutter . A central puncture in the anterior capsule was made with automated vitrectomy cutter. The automated vitrectomy cutter probe was then positioned in the centre of the anterior capsule in such a way that its cutting port was positioned posteriorly. The automated vitrectomy cutter was started and suction was gradually increased until the capsule edge was engaged. The automated vitrectomy cutter was moved in spiral fashion until the desired capsulotomy

was achieved. A 5.00 millimeter in diameter central and circular opening in the anterior capsule was made.

All data including preoperative, operative and post operative recordings was collected in the especially designed proforma. All the data was computer based and SPSS version 10 was used for analysis. Mean and standard deviation was computed for quantitative variables. Frequencies and percentages were computed for qualitative variables.

RESULTS:

A total 30 eyes fulfilling the inclusion criteria were enrolled in the study to evaluate the clinical efficacy and technique of vitrectorhexis in terms of anterior capsulotomy in children with congenital cataract below the age of eight years, to describe another technique in the management of anterior capsule where same instrument is also needed for posterior capsulotomy and anterior vitrectomy and to enlist the complications during this procedure.

Age range was 0-8 years, we recorded the patients 46.67 % (n=14) between 0-2 years of age, 36.67% (n=11) between 3-4 years, 13.33% (n=4) between 5-6 years and 3.33% (n=1) between 7-8 years of age, mean and standard deviation for age was calculated as 2.97±3.08 years .
(Table No. 1)
Out of 30 cases, 60 % (n=18) were male and 40% (n=12) were female.(Table No. 2)
Frequency of unilateral and bilateral eyes shows 96.67 % (n=29) bilateral and only 3.33 % (n=1) unilateral. (Table No. 3)
Frequency of clinical efficacy was recorded in 83.33 %(n=25) while 16.67 % (n=5) were not treated effectively (as per operational definition). (Table No. 4)

Complications of vitrectorhexis revealed 13.33% (n=4) radial tear during performing anterior vitrectorhexis.In 10.00% (n=3) IOL was implanted in the capsular bag while in 3.33% (n=1) vitrectorhexis was converted and completed with Utrata forceps and IOL was implanted in the ciliary sulcus.

Small sized anterior vitrectorhexis was observed in 3.33% (n=1) patient and radial tear during IOL implantation. No patient was recorded with complications like radial tear during irrigation/aspiration of lens matter, radial tear during removal of viscoelastic substance, IOL decentration and failure to implant IOL. (Table No. 5)

Among 16.67 % (n=5) not treated effectively (according to operational definitions) regarding distribution of frequency of complications shows that 10.00% (n=3) had one complication, 3.33% (n=1) had two complications and 3.33% (n=1) had three complication. (Table No. 6)

TABLE No. 1

AGE DISTRIBUTION
(n=30)

Age (in years)	No. of eyes	%
0-2	14	46.67
3-4	11	36.67
5-6	4	13.33
7-8	1	3.33
Total	**30**	**100**
Mean and sd	**2.97±3.08**	

TABLE No. 2

GENDER DISTRIBUTION
(n=30)

Gender	No. of eyes	%
Male	18	60
Female	12	40
Total	**30**	**100**

TABLE No. 3
FREQUENCY OF UNILATERAL AND BILATERAL EYES
(n=30)

Unilateral/Bilateral	No. of patients	%
Unilateral eye	1	3.33
Bilateral	29	96.67
Total	**30**	**100**

TABLE No. 4

FREQUENCY OF CLINICAL EFFICACY
(n=30)

Clinical Efficacy	No. of patients	%
Yes	25	83.33
No	05	16.67
Total	**30**	**100**

TABLE No. 5
COMPLICATIONS OF VITRECTORHEXIS
(n=30)

Complications	No. of eyes	%
Radial tear during performing anterior vitrectorhexis	4	13.33
Radial tear during Irrigation/ aspiration of lens matter	00	00
Radial tear during IOL implant which had small sized anterior vitrectorhexis	1	3.33
Radial tear during removal of viscoelastic substance	00	00
Conversion of anterior vitrectorhexis in eyes with radial tear	1	3.33
Small sized anterior vitrectorhexis	1	3.33
IOL decentration	00	00
IOL implanted in ciliary sulcus in eyes with radial tear	1	3.33
Failure to implant IOL	00	00

TABLE No. 6
DISTRIBUTION OF FREQUENCY OF COMPLICATIONS
(n=5)

Frequency of complications	No. of Patients	Percentage
One complication	3	10
Two complications	1	3.33
Three complications	1	3.33
> Three complications	00	00
Total	**5**	**100**

DISCUSSION:

Congenital cataract occurs in about 3:10,000 live birth. About two-third cases of congenital cataract are bilateral[1]. Congenital cataract presents problems in the developing countries in terms of human morbidity, economic loss and social burden. Out of the 1.5 million blind children in the world, 1.3 million live in Asia and Africa. In the developing countries the rate of blindness can be as high as 1.5 per 1000 population as compared to the developed countries in which this rate is 1.5 per 10000 population. This figure is 10 times higher in the developing countries.

Pediatric cataract is the most common cause of treatable childhood blindness, accounting for 5–20% of blindness in children worldwide.[2-3] Managing cataracts in children remains a challenge. The timing of treatment is crucial to the visual development and successful rehabilitation of children. Managing pediatric cataract poses important problems related to technical aspects of surgery, changing refraction and functional outcome. However, with refinements in surgical techniques, improvisation in quality and designs of intraocular lenses (IOLs) and amblyopia regimes, both technical and functional outcomes of pediatric cataract surgery are improving.

In congenital cataract an adequate, central, circular and proper sized opening in the anterior capsule is necessary for removal of nucleus and cataract lens material. The anterior capsule is thinner and more elastic than adult with more tendencies to tear radially in children making capsulorhexis more difficult[4]. An anterior capsulotomy without radial tears is necessary for capsular-in-bag fixation of posterior chamber intraocular lens implant.

There are seven methods for anterior capsulotomy in congenital cataract.

i. Manual Continuous Curvilinear Capsulorhexis (CCC) [5]
ii. Kloti Bipolar Radiofrequency Diathermy Capsulotomy [6].
iii. Fugo Plasma Blade Capsulotomy [7].
iv. Multipuncture (Can opener) Capsulotomy [8].
v. Femtosecond Laser-Assisted Capsulotomy with Integrated Optical Coherence Tomography [9].
vi. Pulsed Electron Avalanche Knife for Capsulotomy [10,11].
vii. Vitrectorhexis.

Wilson (1994) performed a comparison of manual (CCC) and mechanized anterior capsulotomy. Because anterior capsule is elastic in young and manual continuous curvilinear capsulorhexis (CCC) is very difficult to perform, Wilson used automated vitrectomy cutter to perform anterior capsulotomy during pediatric cataract surgery (later named vitrectorhexis). [12,13]

Anterior capsulotomy using automated vitrectomy cutter produces a round, circular and proper sized central capsulotomy with low risk of radial tear. The edges are regular, high quality, strong and more elastic than other methods of capsulotomy [14]. Anterior vitrectorhexis is best suitable for infants and manual continuous curvilinear capsulorhexis is best used beyond infancy [15]. The shape, size and edge integrity of anterior capsulotomy are very important to long term centration and fixation of capsular in-bag intraocular lens implant. An ideal anterior capsulotomy technique for congenital cataract would be one that is easy to perform, proper in size and central with a strong, regular, high quality edge that would not tear during removal of lens matter, hydrodissection or during implantation of intraocular lens. The anterior vitrectorhexis fulfills these criteria.

Other advantage of anterior vitrectorhexis is that lens material can be aspirated afterwards without taking instrument from the eye. The lens material is soft in children which can be aspirated by irrigation-aspiration or automated vitrectomy cutter. When we use automated vitrectomy cutter for anterior vitrectorhexis, the gummy cortical lens material can easily be aspirated by it by using only aspiration mode.

Posterior capsule opacification is the most common complication of congenital cataract surgery. Posterior capsule opacification is very rapid in pediatric cataract surgery leading to amblyopia. The anterior vitreous face is linked with posterior capsule. This face is very reactive in children. The exaggerated inflammatory response in children leads to membrane formation on the anterior vitreous face. This causes opacification of the visual axis.

To prevent posterior capsule opacification, primary posterior capsulotomy with anterior vitrectomy is the method of choice in the treatment of congenital cataract. When anterior vitrectomy has been planned in addition to posterior capsulotomy, anterior capsulotomy is best performed with automated vitrectomy cutter without need of another instrument or technique.

With experience in using the vitrectomy cutter, a more rounded capsulotomy of desired size can be

consistently made. The vitrectorhexis edge is not as stable as the manual CCC edge[16] and extra care must be taken to avoid leaving right-angle edges. We noted radial tear during IOL implantation in patient with small sized vitrectorhexis.

In our series, age range was 0-8 years, we recorded majority of the patients between 0-2 years of age i.e. 46.67% (n=14) and the mean age was 2.97±3.08 years , 60% (n=18) were male and 40% (n=12) were female, frequency of clinical efficacy was recorded in 83.33% (n=25) while 16.67% (n=5) were not treated effectively (as per operational definition), complications of vitrectorhexis revealed 13.33% (n=4) radial tear during performing anterior vitrectorhexis, 3.33% (n=1) radial tear during IOL implantation, 3.33% (n=1) conversion of anterior vitrectorhexis, 3.33% (n=1) small sized anterior vitrectorhexis and 3.33% (n=1) IOL implanted in ciliary sulcus while no patient was recorded with radial tear during irrigation/aspiration of lens matter, radial tear during removal of viscoelastic substance, IOL decentration and failure to implant IOL.

It may be hypothesized that with increasing experience with this technique, the development of these complications may be reduced. I do not recommend this technique above 6 years of age because only one eye was included in this study.

The results of the study with support of other studies reveal that vitrectorhexis is well suited for use in children in younger age due to their highly elastic anterior lens capsule.

CONCLUSION:

Vitrectorhexis is well suited method of anterior capulotomy in children with congenital cataract below 6 years of age.

RECOMMENDATIONS:

The following recommendations are offered:

1. Use a vitrectomy cutter supported by a Venturi pump.
2. Make an incision that matches the gauge of the automated vitrectomy cutter, thus assuring that the incisions into the eye provide for a tight fit while the instruments are in the eye. Make a separate incision for the anterior chamber maintainer.
3. Separate the incisions for the anterior chamber maintainer and automated vitrectomy cutter by at least 4 clock hours apart.
4. Do not begin the anterior vitrectorhexis with a bent-needle cystitome. Instead, place the automated vitrectomy cutter, with its cutting port positioned posteriorly, in contact with the intact anterior capsule.
5. Care should be taken to avoid right-angled edges, which are predisposed to radial tear formation.
6. Use continuous engage and advance vitrectomy technique.
7. A high cutting rate of 650 cuts per minute with low infusion rate is recommended when cutting the vitreous.
8. Perform hydrodissection gently. High pressure can lead to radial tear.

REFERENCES:

1. Kanski JJ, Bowling B. Clinical Ophthalmology-A systemic Approach. 7th ed. London: Elsevier Saunders, 2011: ch.5:157-62.
2. Foster A, Gilbert C, Rahi J. Epidemiology of cataract in childhood: a global perspective. J Cataract Refract Surg. 1997; 23:601-4.
3. Gilbert C, Foster A. Childhood blindness in the context of VISION_2020_the right to sight. Bull world health organ. 2001; 79:227-37.
4. Kuszak JR, Browns HG. Embryology and antomy of the lens. In: Albert DM, Jakabiec FA, eds. Principles and practice of ophthalmology. Philadelphia: W.B. Saunders; 1999: 82-96.
5. Neuhann T. Capsulorrhexis. In: Steinert RF, ed. Cataract Surgery- Technique, Complications, Management. St Louis: Saunders; 2004: 137-45.
6. Kloti R. Anterior high frequency capsulotomy. I. Experimental study. Klin Monatsbl Augenheilkd. 1992; 200: 307-10.
7. Fugo RJ, Singh D, Fine IH. Automated Fugo Blade Capsulotomy: A New Technique and a New Instrument. Eyeworld. 2002; 7,9: 49-54.
8. Gimbel HV. De Broff BM. Surgical management of pediatric cataract. In: Steinert RF, ed. Cataract Surgery- Technique, Complications, Management. St Louis: Saunders; 2004: 273-93.
9. Palanker DV, Andersen MS. Femtosecond Laser-Assisted Capsulotomy with Integrated Optical Coherence Tomography :Science Translational Medicine; Nov 2010, volume issue 58.
10. Palanker DV, Miller JM, Marmor MF, et al. Pulsed electron avalanche knife (PEAK) for intraocular surgery. Invest Ophthalmol Vis Sci 2001; 42:2673–2678.
11. Siegfried G. Priglinger MD, Christos H. Pulsed electron avalanche knife for capsulotomy in

congenital and mature cataract.J Cataract Refract Surg; 2006; 32: 1085-8.

12. Wilson ME, Bluestein EC, Wang XH, et al. Comparison of mechanized anterior capsulectomy and manual continuous capsulorhexis in pediatric eyes. J Cataract Refract Surg 1994; 20:602-6.
13. Andreo LK, Wilson ME, Apple DJ. Elastic properties and scanning electron microscopic appearance of manual continuous curvilinear capsulorhexis and vitrectorhexis in an animal model of pediatric cataract. J Cataract Refract Surg 1999; 25: 534-9.
14. Wilson ME. Anterior capsule management for pediatric intraocular lens implantation. J Pediatr Ophthalmol Strabismus 1999;36:314-9.
15. 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. JAAPOS. 2007; 11(5):443-6.
16. Wilson ME. Anterior lens capsule management in pediatric cataract surgery. Trans Am Ophthalmol Soc. 2004;102:391–422.