

VISUAL REHABILITATION AFTER CONGENITAL CATARACT SURGERY

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SUMMARY – The purpose of this paper is to show the postoperative visual rehabilitation of children who underwent congenital cataract surgery. Altogether there were 54 eyes (34 children) observed depending on the age of children at the time of surgery, on the kind of cataract, on the associated eye anomalies and the kind and power of optical correction. According to our results (and the results of other respectable authors) we recommend that congenital cataract surgery should be performed as soon as possible, especially by total and by monocular cataract. At the age 2-3 it is necessary to implant an intraocular lenses, but in the monocular cataract even earlier.

We choose the power of the IOL in order to make the eye emetropic at the time of the surgery. We correct the subsequent myopia with contact lenses or glasses. In children who did not have the IOL implanted, contact lenses must be applied immediately.

In case of a monocular cataract it is necessary to start the treatment of the amblyopia by the occlusion of the better eye immediately after surgery.

Key words: *congenital cataract, surgical treatment, postoperative visual rehabilitation, deprivation amblyopia*

Introduction

In 1978 the esteemed ophthalmologist Mameneč¹ at the symposium about the congenital cataract said the following: In my opinion the treatment of the congenital cataract is even today unsatisfactory, difficult and full of contradictions.

Since then until today a lot has been changed for the better, but the point of this statement is true even today.

A study² done in Croatia in 1988 analysed the children who had surgery due to congenital cataract and it was found out that over 50% of the operated children showed the visual acuity worse than 0,1. In case of monocular cataract not even one eye could postoperatively see better than 0,1. About 70% of these children had the surgery performed after the age of 3.

In the analysis of the children cataract at the Rehabilitation centre for the blind and the

partially sighted «Vinko Bek» in Zagreb it was established that in the 15% of cases the congenital cataract was the cause of blindness and partial sightedness.

In the seventies of the last century von Noorden^{3,4} published the theory about the deprivation amblyopia which partially explained the reason for such bad functional results, especially by the monocular cataract. Namely, vision is developed in the first years of life through maturing process of all elements of the visual pathway. For this the light stimulus which penetrates into the eye is necessary. If in the first months of life (according to most recent insights until the age of 5) this stimulus is prevented – deprivation - and if such state continues for 36 months it causes damage of neurons in cortical and subcortical centers especially in *corpus geniculatum laterale*. It results in the deprivational amblyopia. This process happens also in the congenital cataract, especially at the monocular one. This amblyopia is very refractory, but it can also be reversible if

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the cause of deprivation is detected early enough and there is intensive treatment of amblyopia by the occlusion of the better eye (Birch, Stroger).⁵ The treatment has to start in any case before the age of 2,5. Some authors (Wright)⁷ make reports about very good results after such treatment, even the achievement of the binocular vision.

Where do we stand today in regard to the statements above?

Surgical procedures have progressed to minimally traumatizing extracapsular extraction in addition to which the anterior vitrectomy is often performed today. The IOL implantation by congenital cataract has not been recognized until the nineties mostly due to the fact that refractory state of the child's eye is changing in the first years of life. The axial length of the eyeballs increases, the refractive power of lens diminishes, the corneal curvature changes, which results in emetropy from the initial hypermetropia. This processes of emetropisation are most intensive in the first 4 years of life (Gordon, Donzis).⁶

If at the time of surgery at early age we want to achieve the emetropy by the IOL implantation, the myopia can be expected later. For this reason there are discussions concerning the age when the implantation should take place and the power of the IOL.

Considering the fact that the refractory state changes mostly in the first 2-3 years of life, by implanting after that age much rarer occurrences of myopia should be expected. The monocular cataract in which the implantation is indicated even earlier in order to prevent the deprivation amblyopia makes the exception.

Opinions are divided regarding the power of the IOL. Some authors (Wright)⁷ think that the lens of such power should be implanted which will result in emetropy at the time of surgery, but the later myopia should be additionally corrected by contact lenses. He even expresses the opinion that the hypercorrection should be done and so to correct for near because «the child's world is at earliest age happening at near».

The other extreme is expressed by the authors (Khatet, Koch)⁸ whose opinion is that hypocorrection should be done so that later emetropy will be achieved through growth.

Dahan⁹ brings the scheme according to which hypocorrection should be done depending on the length of bulb (at the age under 2 biometry should be done as well as the hypocorrection for 20%, and after the age of 2 hypocorrection for 10%)

Patients and methods

Thirty four children (54 eyes) operated at the University Department of Ophthalmology due to congenital cataract were subjected to analysis. The majority of children were operated by the standard methods of extracapsular extraction combined with the anterior vitrectomy and then by the implantation of the IOL.

The surgical procedure:

- anterior capsulorhexis (bipolar diathermy)
- lens extraction (bimanual irrigation-aspiration)
- posterior capsulorhexis
- anterior vitrectomy
- IOL implantation into the posterior chamber or the capsular sack

The posterior capsulorhexis and the anterior vitrectomy are regularly performed by the age of 5 and to the older children exceptionally during surgery. The power of IOL is determined biometrically based on the length of the eye. PMMA IOL, heparinized, of a smaller diameter (5,5 - 6,5mm) is used. The lenses are implanted at the age of 2-3, and in case of monocular cataract even earlier. Some time after surgery skiascopy was done for all the children, and if necessary the additional correction by glasses or contact lenses was given. For children without implanted IOL contact lenses were prescribed immediately.

In the case of monocular cataract if IOL has not been implanted - contact lenses were immediately applied and the treatment of the better eye by occlusion started. The occlusion is performed by parents for about a half of their child's waking period, in practice as much as possible.

Results

Altogether there were 34 patients (54 eyes) who underwent surgery. The monocular cataract was represented in 14 and the binocular in 20 children. According to the kind, in 40 eyes the cataract was total, but in 14 partial (table 2.). The age of operated children is shown on the table 3. It is evident that the great number of children²¹ are operated in the first 2 years of life, thus in the earliest, most critical period for deprivational ambliopia.

In Table 4 individual surgical procedures are analyzed. The majority of patients are operated on by ECCE + anterior vitrectomy procedure and by 26 the IOL is also implanted.

The most frequent associated eye anomalies are analyzed in Table 5. As it is well known the congenital cata-

Table 1. Guidelines for intraocular lens implantation

For children younger than 2 years do biometry and undercorrect by 20 % or use axial length only:	
axial length, mm	IOL power, D
17	28,00
18	27,00
19	26,00
20	24,00
21	22,00

For children between 2 and 8 years

cataract is often associated with the other eye and sometimes also with some systemic anomalies.

The applied optical correction is analyzed in Table 6. By the majority of children the IOL was implanted and in others the contact lenses were applied.

Table 2.

Total number of operated eyes		type of cataract	
monocular	14	total	40
binocular	20	partial	14

In Table 7 the achieved postoperative visual acuity is displayed, depending on the kind of optical correction. In the case of monocular cataract considerably better visual acuity (even also 0,9) was achieved for patients with implanted IOL. Also in the case of the binocular cataract better results were achieved with IOL vs. contact lenses, but the worst functional results were found in 4 patients who were corrected by glasses. About 2/3 of our patients are the children of under 2 years of age, who are too small for the exact examination of the visual acuity, but almost all of them show satisfactory postoperative results (they reach for an object, move independently, and have good spatial orientation).

Table 3

Age of patients	
first year	11
second year	10
2 - 5 years	7
over 5 years	6

Table 4

Type of surgery	
ECCE	4
phacoemulsification	4
ECCE + anterior vitrectomy	20
ECCE + anterior vitrectomy + IOL	26

Table 5

Complications and associated anomalies	
strabismus	12
nystagmus	6
secondary cataract	2
other eye anomalies (microphthalmus, coloboma, uveitis)	10

Table 6

Optical correction	
IOL	20
contact lenses	10
glasses	4

Table 7

Postoperative visual acuity	
IOL	
monocular cataract	0,1 – 0,9
binocular cataract	0,1 – 0,8
Contact lenses	
monocular cataract	0,1 – 0,5
binocular cataract	0,2 – 0,6
Glasses	
only binocular cataract	0,05 – 0,5

Discussion

According to the current insights, a confident attitude can be taken that the congenital cataract should be operated as soon as possible in the literal sense. The theories of von Noorden about the deprivational amblyopia have substantially contributed toward the understanding of the

process of the visual maturation and the meaning of deprivation at the earliest period of this maturation. The surgery needs to be performed by the method which renders best results and which has the least traumatising effect for the eye.. Today it is the method of extracapsular extraction combined with the anterior vitrectomy and then the IOL implantation taking into account all the indications. In the case of the monocular cataract it is of the decisive importance to additionally perform the treatment of the ambliopia by the better eye occlusion. The majority of our patients were operated on until the age of 2 and in their cases the best functional postoperative results were achieved. The IOL implantation proved itself to be the best way of optical correction, but satisfactory results were also achieved by application of contact lenses. In children without the IOL implantation the contact lenses were applied immediately after surgery. Exceptionally in the case of 4 patients we have done the optic correction by glasses and this has turned out to be the worst way of correction. The children who had an accompanying strabismus were operated on with satisfactory postoperative status.

With the children with preexistent nystagmus we have the experience that the nystagmic eye movements after the congenital cataract surgery are substantially decreased, sometimes even disappear.

The most difficult problem is the monocular cataract. By an early surgery, an adequate optical correction – IOL is the best – an early treatment by the better eye occlusion, we have achieved a satisfactory postoperative visual acuity, in some eyes even 0,9.

Conclusion

The treatment of the congenital cataract needs to be started as soon as possible, especially by the monocular cataract and by the total cataract. The extracapsular extraction combined with the anterior vitrectomy is today the surgical procedure which renders best results.

The best way of optical correction is the IOL implantation, especially by monocular cataract but the worst way of correction is the one with the glasses.

It is best to implant the IOL to the children after the age of 2-3, by monocular cataract even earlier. By the IOL implantation we determine the power of IOL by biometry based on the axial length of the eye, making effort to achieve the emetropy at the time of surgery. We believe that it is of decisive importance that the child would be optimally corrected at earliest age, during the period of visual maturation, which is critical for deprivation ambliopia. The later occurrence of myopia can be adequately corrected by contact lenses. This is especially relevant for monocular cataract, for which it is absolutely the most acceptable way of correction. Eventual myopic anisometropia which can later occur is considerably less ambliopiogenic than hypermetropic. In the case of monocular cataract it is necessary to perform the better eye occlusion immediately after surgery and that for about a half of the child's waking period. With such treatment it is possible to achieve very satisfactory functional postoperative results.

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Sažetak

REHABILITACIJA VIDA NAKON OPERACIJE KONGENITALNE KATARAKTE

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Cilj ovog rada je prikazati rehabilitaciju vida kod djece operirane radi kongenitalne katarakte. Obrađeno je 34 djece (54 oka) u ovisnosti o dobi u kojoj je operacija bila učinjena, vrsti katarakte, pridruženim očnim anomalijama, te vrsti i jačini optičke korekcije. Prema našim rezultatima (a oni se slažu s rezultatima drugih respektabilnih autora) smatramo da kongenitalnu kataraktu treba operirati što ranije, osobito kod totalne i monokularne katarakte. Intraokularnu leću (IOL) potrebno je ugraditi kod djece iznad 3 godine starosti, a kod monokularne katarakte i ranije. Jačinu IOL izabiremo nastojeći načiniti približnu emetropiju u trenutku operacije. Kasniju eventualnu miopiju korigiramo kontaktnim lećama ili naočalama. Kod djece kod koje nije bila ugrađena IOL odmah apliciramo kontaktne leće. Kod monokularne katarakte neophodno je odmah nakon operacije započeti tretman ambliopije okluzijom vodećeg oka.

Ključne riječi: *kongenitalna katarakta, operativno liječenje, postoperativna rehabilitacija vida, deprivacijska ambliopija*