

**FEATURES OF CALCULATING THE OPTICAL POWER OF AN  
INTRAOCULAR LENS IN CHILDREN WITH CONGENITAL CATARACTS AT  
THE RISK OF DEVELOPING PSEUDOMYOPIC MYOPIA.**

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**Abstract**

*The article presents the results of the clinical efficacy of the calculation formula with the correction factor of the optical force of the intraocular lens in children with congenital cataracts at risk of development of pseudophakic myopia. Personalized Rm corrective coefficient in the formula for calculating the force of IOL in children with risk of development of pseudophakic myopia makes it possible to achieve target refraction in 83.3% cases and reduce the development of reduce myopic refraction.*

**Keywords:** *congenital cataract, pseudophakic myopia, intraocular lens power calculation*

**Introduction.** To date, congenital cataracts (CC) occupy a significant place in the structure of blindness and weakness and are one of the main causes of disabilities in vision from childhood [1-5]. The modern and optimal method of treating CC is its extraction with an implantation of an intraocular lens (IOL). There are a large number of formulas for calculating the optical force of IOL to adult patients. In pediatrics, the formulas SRK II, SRK \ T, taking into account the sagittal size of the eyeball, refracting the power of the cornea and the individual constants of the selected model of IOL are used. When calculating the optical force of implanable IOL, children of the first year of life determine the magnitude of hypocorrection (from (+) 4.0 to (+14.0 d)) refraction, taking into account the refraction of the cornea, the difference in the original and predicted axial length (AL) after the completion of the physiological growth of the eye [6-8]. However, it is not known which of the formulas used are more predictable when calculating the strength of the lens in children with the risk of the development of myopic refraction. One of the most complex and important points remains the calculation of target refraction with the continued growth of the eyes during the formation of a child's visual analyzer with the risk of myopia after IOL implantation.

**Purpose.** Evaluation of the clinical efficacy of the recommended calculation of the optical force of IOL in children with congenital cataracts at risk of the development of pseudophakic myopia.

**Material and methods.** Under our observation in the eye department of the clinic of the Tashkent Pediatric Medical Institute, there were 24 (43 eyes) of the child with CC. All patients underwent extracapsular CC extraction with implantation of soft IOLs at the age of 1 to 5 years. Children were distributed to 2 groups. In I (basic), the group includes 11 (21 eyes), in II - (control) 13 (22 eyes) of patients. All children had a risk of developing pseudophakic myopia. The optical power of the IOL in the control group was calculated according to the traditional SRK II formula with the age-related refractive hypocorrection [9], in the main and also according to the SRK II formula with the age-related refraction, but with the Rm correction factor recommended by us.

The results of refractive indicators were studied in 3-12 months after surgery.

**Results and discussion.**

The SRK II formula with an introduced correction factor has the form:

$$P = [(A - 2.5 \times L - 0.9 \times K) - R] - R_m$$

P - optical power of IOL (dptr)

A - constant determined by the manufacturer of IOL

L - axial length (mm), is measured by each child individually

K - keratometry refractive power of the cornea (dptr), is measured by each child individually

R - is an indicator of age residual refraction (dptr)

R<sub>m</sub> - correction factor (dptr) is determined by the original own formula based on clinical studies.

The correction factor (R<sub>m</sub>) was determined by formula 1.

The formula of a certain correction factor:  $R_m = AL_p \times 0.82$ , where the AL is an indicator of the average physiological growth of the AL<sub>p</sub> of the child by the time the physiological growth of the eyeball (15 years) is preached on the basis of indicators of ultrasonic biometrics of healthy eyes in children under 15 M.D. Agatova [10].

Constant 0.82 - (dptr / mm) -Mixed as a result of our statistical analysis using linear approximation of experimental data The dynamics of refraction and the increase in the AL of children with pseudophakic aged 1 to 5 years with abnormal refractogenesis, 3 years after extraction CC and IOL implantation.

The refractive force of IOL varied in the I group - from (+) 16.0 to (+) 21,5 dptr, in group II from (+) 19.0 to (+) 24,0,2 dptr. The magnitude of the age hypocorrection was +3.0 - +8.0 dptr. Keratometric indicators were in the range from 39.94 to 45.75 dptr. The magnitude of the AL of the eyeball from 18.5 to 24.25 mm.

Analysis of indicators of children's refraction, conducted 3 months after extraction CC with implantation IOL made it possible to reveal the deviation from the planned - target refraction in the main group of 9.6%, in the control - in 41% cases. In the control group, myopia is registered with a light degree of 4.6% and emmetropia, disproportionate age (reinforcement of refractive) in 36.4% of cases, respectively (Table 1).

Table 1  
**Dynamics of children refraction**  
**(n - the number of eyes)**

Refraction Groups	Emmetropia, disproportionate to age		Hypermetropia age-appropriate refraction (target)		Mild myopi		Total	
	abs.	(%)	abs.	(%)	abs.	(%)	abs..	(%)
Basic (n= 21)	2	9,6	19	90,4	-	-	21	100
Control (n= 22)	8	36,4	13	59	1	4,6	22	100

Refractometry 12 months after CC extraction with IOL implantation revealed a deviation from the target refraction in the main group in 16.6%, in the control group-in 54.5% of cases. In the control group, mild myopia was registered in 13.6% and emmetropia,

disproportionate to age, in 40.9% of cases, respectively. Target refraction was achieved in the main group in 83.3%, in the control group-in 45.4% of cases (Table 2).

**Table 2**  
**Dynamics of children refraction**  
**(n - the number of eyes)**

Refraction Groups	Emmetropia, disproportionate to age		Hypermetropia age-appropriate refraction (target)		Mild myopi		Total	
	abs.	(%)	abs.	(%)	abs..	(%)	abs..	(%)
Basic n=18	3	16,6	15	83,3	-	-	18	100
Control n=22	9	40,9	10	45,4	3	13,6	22	100

In the patients of the main group, visual functions reached an average of  $0.5 \pm 0.001$ , in the control group  $0.2 \pm 0.001$  (Table 3).

**Table 3.**  
**Indicators of visual acuity before and after surgery in children ( $M \pm m$ ).**

	Before the operation	After the operation	
		after 3 months	через 1 год
Basic group	$0,03 \pm 0,001$ (n=21)	$0,27 \pm 0,0015$ (n=21)	$0,5 \pm 0,001$ (n=18)
Student's t-test		$t=133,3(p \leq 0,05)$	$t=226,27(p \leq 0,05)$
Control group	$0,03 \pm 0,001$ (n=22)	$0,15 \pm 0,002$ (n=22)	$0,2 \pm 0,001$ (n=22)
Student's t-test		$t= 53.67(p \leq 0,05)$	$t= 155,56(p \leq 0,05)$

n- number of eyes

**Conclusion.**

Based on the results obtained, it can be concluded that the personalized correction factor  $R_m$  in the formula for calculating the strength of IOL in children at risk of developing pseudophakic myopia allows achieving the target refraction in 83.3% of cases (vs. 45.4% of cases in the control group) and reducing the development of strong refraction by 37.9%, as well as increasing visual acuity to  $0.5 \pm 0.001$  (vs.  $0.2 \pm 0.001$  in the control group).

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