

# Strabismus in developmental cataract

A. MAGLI<sup>1</sup>, A. IOVINE<sup>1</sup>, D. BRUZZESE<sup>2</sup>, U. GIANI<sup>2</sup>, F. FIMIANI<sup>1</sup>

<sup>1</sup>Department of Ophthalmology, University of Napoli "Federico II"

<sup>2</sup>Department of Preventive Medical Science, University of Napoli, Napoli - Italy

**PURPOSE.** *To evaluate the presence of strabismus in patients with developmental cataract rendered pseudophakic and how this influences their visual acuity.*

**METHODS.** *A retrospective study was carried out on 113 patients with developmental cataract who came under the authors' observation at the outpatient department of the Pediatric Ophthalmology Unit of the University of Federico II of Naples from 1990 to 2005. All patients were followed up for a long period (mean 62 months, range 36–144 months). Age at diagnosis, sex, laterality, age at cataract extraction, morphology, and cataract density were all considered as possible factors associated with strabismus. Visual acuity and ocular motility before and after cataract extraction surgery were especially noted. Statistical evaluation was performed using t-test, Chi-square test, and Fisher exact test.*

**RESULTS.** *Out of the 113 patients a total of 181 eyes were affected: 68 patients (60%) presented bilateral cataract, 45 patients (40%) monolateral cataract. Strabismus was present in 39 patients (34%) before cataract surgery. Age at cataract diagnosis, age at surgery, sex, and cataract morphology were not found to be statistically associated with strabismus. However, laterality was found to be statistically associated with the onset of strabismus. Cataract density was found to be statistically associated with poor vision. Patients with strabismus presented a non statistically significant lower visual acuity.*

**CONCLUSIONS.** *Strabismus has a greater incidence in developmental cataract compared to the general population, and can influence visual acuity, especially in monolateral and total cataracts. Intraocular lens implants produced satisfactory visual rehabilitation. (Eur J Ophthalmol 2008; 18: 540-3)*

**KEY WORDS.** *Strabismus, Cataract, Pseudophakia*

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## INTRODUCTION

Intraocular lens (IOL) implant is increasingly recommended for the visual rehabilitation of patients with congenital developmental cataract rendered aphakic (1, 2). One of the factors that influence the successful outcome of IOL in visual rehabilitation is the presence of strabismus (3). Few studies in the literature deal with the incidence of strabismus in pseudophakic pediatric patients; the purpose of the present study is to evaluate the prevalence of strabismus and how much it influences visual performance in patients with developmental cataract rendered pseudophakic.

## METHODS

A retrospective study was carried out on 113 patients with developmental cataract observed at the outpatient department of the Paediatric Ophthalmology Unit of the University of Federico II of Naples from 1990 to 2005.

The patients were followed up for an average of 48 months (range 36 to 120 months); a surgical IOL implant in the capsular sac or in some cases in the ciliary groove was carried out when necessary.

All patients underwent periodic ophthalmologic examinations both prior to and following cataract extraction surgery. Particular attention was paid to the morphology

of the cataract which was evaluated by slit lamp biomicroscopy. Cataract density was also evaluated. Patients were divided into two groups: total cataract (occlusion > 3 mm, absence of red reflex) and partial cataract. Visual acuity (VA) was estimated by Albin's E test in children <3 years of age, and in some cases of noncooperative children with Teller Acuity Cards test. The presence of strabismus was ascertained with the alternate cover and Krimsky test and Hirschberg test when necessary. A deviation >10 PD (diopter prisms) was considered as strabismus. Furthermore, cataract laterality, sex, age at diagnosis, and age at cataract surgery were taken into account as possible factors associated with strabismus. Occlusion therapy was performed in amblyopic patients both preoperatively and postoperatively.

Any post-traumatic cataracts and cataracts secondary to other pathologies were excluded from the study.

Statistical evaluation was performed using *t*-test, chi-square test, and Fisher exact test. *p* Values below 0.05 were taken as statistically significant.

## RESULTS

Out of 113 patients examined—51 female (45%) and 62 male (55%)—181 eyes were affected: 68 bilateral cataract (60%) and 45 monolateral (40%) cataracts; 90 (49.7%) total cataracts and 91 (50.3%) partial cataracts. The patients were divided into two groups: all the patients who presented strabismus following cataract extraction surgery and the orthotropic patients in the second group. Various factors were analyzed in relation to strabismus.

Table I outlines general data of these groups. Ages at diagnosis were found to be similar in both groups. The mean age of the first group was 52.21 months vs 56.60 months ( $p=0.595$ ) in the second group; the mean age at cataract extraction surgery was 103.79 months in the first group vs 122.51 months in the second group ( $p = 0.152$ ). The first group was made up of 16 girls and 30 boys whereas the second group was made up of 35 girls and 32 boys ( $p=0.084$ ). The various cataract morphologies observed are reported in Table I; they were not found to have a statistically significant association with strabismus ( $p=0.240$ ). No statistical association was found between cataract density and strabismus ( $p=0.853$ ) (Tab. I); instead a statistical association was found with poor vision ( $p<0.01$ ): in fact, 17% of eyes with total cataract vs 0% of eyes with partial cataract had AV  $\leq 20/200$ , and 30% of

eyes with total cataract vs 99% of eyes with partial cataract had AV  $\geq 20/40$  (Tab. II).

However, the laterality of the two groups taken eye by eye was found to be a statistically significant factor associated with strabismus ( $p=0.002$ ): in the first group 41% were monolateral cataracts and 59% were bilateral, whereas in the second group there were 18% monolateral cataracts and 82% bilateral (Tab. III).

Strabismus before cataract extraction surgery was present in 39 patients (34%) and was observed in 46 patients (41%) after surgery. Two patients (2%) presented nystagmus (Tab. IV).

**TABLE I - GENERAL DATA**

	Group I: Strabismus (n=46)	Group II: No strabismus (n=67)	<i>p</i> value
Age at diagnosis, mo	52.21	56.6	0.595*
Age at cataract extraction, mo	103.79	122.51	0.152*
Sex			0.084†
Female	16 (35)	35 (52)	
Male	30 (65)	32 (48)	
Cataract density			0.853
Total	26 (56.5)	35 (52)	
Partial	20 (43.5)	32 (48)	
Type of cataract			0.240‡
Total	9 (17)	18 (14)	
Posterior subcapsular	6 (11)	17 (13)	
Posterior lenticonus	3 (6)	3 (2)	
Zonular	14 (26)	52 (41)	
Other	22 (40)	37 (30)	

Values are n (%).

\**t*-Test.

†Chi-square test.

‡Fisher exact test.

Other = Anterior polar, Posterior polar, Pyramidal, lamellar

**TABLE II - THE INFLUENCE OF CATARACT DENSITY ON VISUAL ACUITY IN 172 EYES**

Visual acuity	Eyes with total cataract (n=81)	Eyes with partial cataract (n=91)	<i>p</i> value
$\geq 20/40$	24 (30)	90 (99)	<0.01*
20/200–20/40	43 (53)	1 (1)	<0.01*
$\leq 20/200$	14 (17)	0	<0.01*

Values are n (%).

\*Chi-square test

Table V shows pre-surgery VA. In the first group (54 eyes) it was estimable in 23 eyes of which 15% had VA 20/40 < 20/200, and 85% had VA ≤ 20/200, whereas in the second group (127 eyes) VA was estimated in 84 eyes of which 4% had VA ≥ 20/40, 33% 20/40 < 20/200, 63% ≤ 20/200 (p=0.063).

Table VI reports post-surgery VA data. VA was evaluated in 48 eyes of the first group (54 eyes) of which 54% had VA ≥ 20/40, 36% 20/40 < 20/200, and 10% ≤ 20/200 whereas in the second group (127 eyes) 124 eyes were evaluated of which 71% had VA ≥ 20/40, 22% 20/40 < 20/200, and 7% VA ≤ 20/200 (p=0.088). The morphology of the cataract was analyzed in relation to VA: before surgery (p= 0.018) it was found on comparing total cataract to zonular cataract; no statistical significance was found (p=0.290) after surgery. Amblyopia was present in 40% of patients. Seventeen patients (15%) experienced postoperative complications of which 11 (10%) had capsular opacity, 4 (3.6%) lens dislocation, and 2 (1.8%) secondary glaucoma.

DISCUSSION

The incidence of strabismus in the general population is estimated at between 1% and 4% (3-5). In a recent study carried out in Minnesota on a population of 100,000 boys

and 100,000 girls under 19 years of age an incidence of 2.34% esotropia, 1.25% exotropia, and 0.62% hyper-tropia was found (4-6).

There is little literature on the incidence of strabismus in the pediatric population affected by cataract. Atrata et al (7) working on a sample of 41 patients found that 44% of IOL implant patients presented strabismus before surgery and 55% after surgery, whereas of 23 patients corrected with LAC 48% presented strabismus preoperatively and 83% postoperatively. Weisberg et al (3) studying 94% pseudophakic patients found strabismus pre-surgery in 35 patients (37%), of which 21 were exotropia, 13 esotropia, and 1 combined, and in 37 patients (39%) after cataract extraction and primary IOL implantation, of which 17 were exotropia, 15 esotropia, and 5 combined. Awner et al (8) in a study of 21 patients reported preoperative strabismus in 29% (exotropia 83%, esotropia 17%) and in 43% after cataract extraction (exotropia 56% esotropia 44%). We also observed a greater incidence of strabismus in our study with respect to the general pediatric population. Strabismus was present in 34% of patients preoperatively and in 41% postoperatively. Gender, diagnostic age, age at surgery, cataract morphology, and cataract density were not found to be statistically associated with strabismus. However cataract laterality was

TABLE III - SIDE AFFECTED BY CATARACT IN RELATION TO EYES

Laterality of cataract	Group I: Strabismus (n=54)	Group II: No strabismus (n=127)	p value
Bilateral	32 (59)	104 (82)	0.002*
Unilateral	22 (41)	23 (18)	

Values are n (%).

\*t-Test

TABLE IV - TYPE OF STRABISMUS

	Strabismus before cataract extraction	Strabismus after cataract extraction
Patients	39/113 (34)	46/113 (41)
Esotropia	18 (46)	20 (43)
Exotropia	19 (49)	18 (39)
Combined strabismus	2 (5)	8 (18)

Values are n (%)

TABLE V - VISUAL ACUITY IN 84 EYES AFFECTED, BEFORE CATARACT EXTRACTION

Visual acuity	Group I: Strabismus (n=54)	Group II: No strabismus (n=127)	p value
≥20/40	0/33 (0)	3/84 (4)	0.063*
20/40 < 20/200	5/33 (15)	28/84 (33)	
≤20/200	28/33 (85)	53/84 (63)	

Values are n (%).

\*Fisher exact test

TABLE VI - VISUAL ACUITY IN 172 EYES AFFECTED, AFTER CATARACT EXTRACTION

Visual acuity	Group I: Strabismus (n=54)	Group II: No strabismus (n=127)	p value
≥20/40	26/48 (54)	88/124 (71)	0.088*
20/40 < 20/200	17/48 (36)	27/124 (22)	
≤20/200	5/48 (10)	9/124 (7)	

Values are n (%).

\*Fisher exact test

found to be statistically associated with the presence of strabismus ( $p=0.002$ ).

VA in pediatric pseudophakia has been widely reported. Weisberg et al (3) found a better VA in pseudophakic patients who did not present strabismus. In fact, 45% versus 27% of strabismic patients had  $VA \geq 20/40$ , and only 5% of not strabismic patients versus 23% reached a  $VA \leq 20/200$ . Atrata et al (7) report that the mean VA (logarithm of the minimum angle of resolution) was found to be of the operated eye  $0.43 \pm 0.33$  for the IOL group and  $0.58 \pm 0.39$  for the CL group. Awner et al (8) reported VA of 20/40 or better in 52% of patients. Greenwald and Glaser (9) in studying 51 children aged between 2 and 16 years observed that 85% of IOL implant patients presented  $VA \geq 20/100$ . Inatomi et al (10), working with 15 patients rendered pseudophakic following monolateral cataract surgery, reported 79% with  $VA \geq 20/40$ . In our study VA was found to be better in the nonstrabismic group of patients; in fact, postcataract surgery the VA was  $\geq 20/40$  in 71% of patients versus 54% and in 7% versus 10% it was  $\leq 20/200$ ; however, the result was not statistically significant ( $p=0.088$ ).

On analyzing cataract morphology in relation to VA, a statistically significant better pre-cataract extraction visual performance was found in zonular cataract with respect to patients with total cataract ( $p=0.018$ ). No statistical significance was found between cataract morphology and VA postsurgery. In our study cataract density was found to be statistically associated with poor vision ( $p<0.01$ ). Analyzing the VA results obtained in 172 eyes (VA could

not be measured in 9 eyes of noncooperative patients), we found that the eyes with total cataract had poor vision. Strabismus has a greater incidence in developmental cataract and congenital cataract than in the general population.

The laterality factor is associated with the presence of strabismus. Monolateral cataract is associated with poor vision. Strabismus is a factor that has a bearing on VA; this, however, is somewhat less in developmental cataract than in congenital cataract.

The visual results of our pseudophakic patients were satisfactory; we are in agreement with various studies that recommend the use of IOL for the visual rehabilitation of aphakic patients.

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Reprint requests to:  
Prof. Adriano Magli  
Dipartimento Scienze Oftalmologiche  
Facoltà di Medicina e Chirurgia  
Via Sergio Pansini, 5  
80100 Napoli, Italy  
magli@unina.it

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