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LASIK and PRK in refractive accommodative esotropia: a retrospective study on 20 adolescent and adult patients

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PURPOSE. *To evaluate the clinical results obtained with excimer laser treatment of fully refractive accommodative esotropia.*
METHODS. *Fully refractive accommodative esotropia was corrected in 17 patients with laser in situ keratomileusis (LASIK) and in 3 patients with photorefractive keratectomy (PRK). The mean age of the patients at time of refractive surgery was 18.8 years (range 14 to 24 years). All surgical procedures were performed under local anesthesia. The preoperative and postoperative data were retrospectively analyzed with regards to visual acuity, ocular alignment, and stereopsis.*
RESULTS. *The mean preoperative deviation without correction was 18.1Δ for near vision and 13.7Δ for distance vision. After refractive surgery the mean postoperative deviation was 4Δ esophoria at near, and 2.5Δ of esophoria at distance: 10 patients (50%) showed esophoria for both distance and near vision, 2 patients (10%) esophoria only for near vision, and 8 patients (40%) orthophoria for both distance and near vision. Emmetropia (±1.00 D) was obtained in 97.5% of eyes (39 of 40). The mean correction obtained with excimer laser was +4.62 D (range +2.25 to +7.75, SD 4.52). The preoperative BSCVA was in all eyes greater than or equal to 20/30. There were no significant differences observed between the preoperative and postoperative mean best-corrected visual acuity (p=0.32). There were no complications. The follow-up period lasted a mean of 30.2 months.*
CONCLUSIONS. *The treatment of fully refractive accommodative esotropia with excimer laser was found effective and safe, even in young or adolescent patients. More studies are needed to increase the patient experience and extend the follow-up period in order to evaluate the stability of these results over time. (Eur J Ophthalmol 2009; 19: 188-95)*

KEY WORDS. *Fully refractive accommodative esotropia, LASIK, PRK, Laser*

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INTRODUCTION

Refractive accommodative esotropia is a common type of strabismus in which uncorrected hyperopia causes an increase in accommodative force that leads to convergence when the functioning divergence is insufficient. It is characterized by high hyperopia, esotropia, and a normal accommodative convergence to accommodation (AC/A) ratio (1).

In patients with fully refractive accommodative esotropia, correction of the refractive error relaxes accommodation, and thus eliminates the deviation angle. For many years, its treatment consisted of optical correction of the hyperopia with glasses or contact lenses and miotic agents;

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these last have been rejected because of the local and systemic side effects (2).

In theory, purely refractive accommodative esotropia would be an ideal indication for refractive surgery because of the refractive etiology of this form of strabismus. Nonsurgical treatment options do not offer definitive treatment since the esotropia returns as soon as the refractive correction is removed. Few studies have been published regarding the correction of refractive accommodative esotropia with laser in situ keratomileusis (LASIK) (3-7) or photorefractive keratectomy (PRK) (4, 8). The authors found correction of the refractive error with excimer laser a promising, safe, and effective alternative therapy.

This retrospective study represents evidence on a larger series of patients, with a longer follow-up: it presents the results obtained by treating fully refractive accommodative esotropia in young adult patients with LASIK or PRK.

METHODS

Twenty patients (8 male, 12 female: 40 eyes) with fully refractive accommodative esotropia treated between 2002 and 2005 were included in this study. The mean age of the patients at time of refractive surgery was 18.8 years (range 14 to 24 years). All patients underwent an excimer laser procedure for correction of hyperopia: 17 with LASIK and 3 with PRK. The ultimate goal in all patients was eliminating the need for glasses. Inclusion criteria were as follows: age over 14, fully refractive accommodative esotropia, stability of refractive error for a minimum of 2 years, minimum follow-up of 12 months. Patients were excluded from the treatment if any ocular pathology other than hyperopia, fully refractive accommodative esotropia, or amblyopia was observed at the preoperative examination.

The preoperative and postoperative evaluations included the following: a best spectacle-corrected visual acuity (BSCVA) and an uncorrected visual acuity (UCVA) (transformed to logMAR for data analysis and back converted after logMAR analysis as Snellen mean); cycloplegic retinoscopy (one drop of cyclopentolate and tropicamide 1% every 15 minutes for three doses) and manifest refraction for determining refractive error; examination of ocular alignment, assessed using prism and cover testing in all gaze positions (primary position alignment was recorded both with and without glasses); a stereoscopic examination using the Titmus stereo test, with glasses or contact lenses before refractive surgery, without correction afterward; evaluation of the fusional amplitudes with prisms and synoptophore; and evaluation of the use of

TABLE I - DEMOGRAPHIC DATA AND PREOPERATIVE CORRECTION OF 20 PATIENTS WITH REFRACTIVE ACCOMMODATIVE ESOTROPIA TREATED WITH EXCIMER LASER

Patient	Age at treatment, yrs	Sex	Surgical technique	Follow-up, mo	Preoperative correction	
					Right eye	Left eye
1	15	F	LASIK	17	+2.00 +0.50 x 90	+5.00 +1.25 x 105
2	20	F	LASIK	39	+5.00	+5.75
3	19	M	LASIK	29	+5.00 +1.00 x 90	+4.75 +1.50 x 90
4	21	M	LASIK	29	+4.50	+4.00
5	20	M	LASIK	29	+3.00 +2.00 x 105	+5.00
6	22	F	LASIK	25	+5.75 +1.25 x 100	+5.50 +2.00 x 70
7	24	M	LASIK	33	+4.00 +1.00 x 60	+4.00
8	20	F	LASIK	38	+4.75 +1.20 x 75	+5.00 +1.25 x 118
9	19	M	LASIK	38	+3.50 +0.50 x 90	+4.00 +0.50 x 80
10	19	F	LASIK	40	+2.00 +3.00 x 90	+2.00 +3.00 x 90
11	19	F	LASIK	44	+3.00 +0.50 x 90	+3.50 +2.75 x 90
12	19	M	PRK	46	+3.25 +0.50 x 100	+3.25 +0.50 x 85
13	21	F	PRK	34	+3.00 +0.25 x 90	+3.75 +0.50 x 100
14	14	F	LASIK	20	+2.00 +0.50 x 40	+3.25
15	16	M	PRK	16	+4.00	+4.75 +1.50 x 90
16	19	F	LASIK	38	+5.00	+5.25 +0.50 x 90
17	17	F	LASIK	21	+5.00 +1.00 x 180	+5.00 +1.00 x 180
18	17	M	LASIK	22	+4.00 +1.75 x 115	+4.75 +1.25 x 100
19	18	F	LASIK	23	+5.00 +0.50 x 160	+5.00
20	17	F	LASIK	23	+7.00 +1.00 x 60	+7.25 +2.00 x 130

contact lenses (cycloplegic refraction) for 30 days, to stimulate the postoperative refractive condition. Only patients who after 30 days manifested orthotropia or a reduction of the angle of deviation had refractive surgery. Corneal pachymetry, corneal topography, inspection of the posterior and anterior segment, and intraocular pressure were also determined in all patients.

Bilateral simultaneous procedures were performed in all patients. All PRK procedures were performed with a Technolas excimer laser from Bausch and Lomb, model 217-C (wavelength 193 nm, fluence 160 mJ/cm^2). All LASIK procedures were performed using a microkeratome (Moria Evolution, 2-CB) to create a 9.5 mm flap in all patients, while ablation was performed with the above described excimer laser. Flap thickness was 160 µm with an optical zone of 5.5 to 6.0 mm, and a spot

TABLE II - CYCLOPLEGIC REFRACTION AND VISUAL ACUITY BEFORE AND AFTER EXCIMER LASER TREATMENT OF REFRACTIVE ACCOMMODATIVE ESOTROPIA IN 20 YOUNG PATIENTS

Patient	Eye	Preoperative			Postoperative		
		Refractive error (SE)	UCVA	BSCVA	Refractive error (SE)	UCVA	BSCVA
1	OD	+2.25 D	20/40	20/20	+0.25 D	20/20	20/20
	OS	+5.75 D	20/100	20/20	+0.50 D	20/20	20/20
2	OD	+5.00 D	20/70	20/20	Plano	20/20	20/20
	OS	+5.75 D	20/70	20/20	Plano	20/20	20/20
3	OD	+6.00 D	20/70	20/20	Plano	20/20	20/20
	OS	+5.50 D	20/70	20/20	Plano	20/20	20/20
4	OD	+4.50 D	20/50	20/20	Plano	20/20	20/20
	OS	+4.00 D	20/50	20/20	Plano	20/20	20/20
5	OD	+4.00 D	20/60	20/20	Plano	20/20	20/20
	OS	+3.00 D	20/60	20/20	Plano	20/20	20/20
6	OD	+6.50 D	20/70	20/20	Plano	20/20	20/20
	OS	+6.50 D	20/70	20/25	Plano	20/25	20/25
7	OD	+4.50 D	20/70	20/30	Plano	20/25	20/25
	OS	+4.00 D	20/70	20/20	Plano	20/20	20/20
8	OD	+5.50 D	20/80	20/20	Plano	20/20	20/20
	OS	+6.75 D	20/80	20/20	Plano	20/20	20/20
9	OD	+3.75 D	20/50	20/20	+0.50 D	20/25	20/20
	OS	+4.25 D	20/70	20/20	Plano	20/20	20/20
10	OD	+3.50 D	20/70	20/25	+0.50 D	20/25	20/25
	OS	+3.50 D	20/70	20/30	+0.75 D	20/33	20/30
11	OD	+3.25 D	20/70	20/20	Plano	20/20	20/20
	OS	+5.00 D	20/80	20/20	Plano	20/20	20/20
12	OD	+3.50 D	20/40	20/20	+0.50 D	20/20	20/20
	OS	+3.50 D	20/40	20/20	+0.50 D	20/20	20/20
13	OD	+3.25 D	20/50	20/20	Plano	20/20	20/20
	OS	+4.00 D	20/50	20/20	+0.75 D	20/20	20/20
14	OD	+2.25 D	20/25	20/20	Plano	20/20	20/20
	OS	+3.25 D	20/30	20/20	Plano	20/20	20/20
15	OD	+4.00 D	20/50	20/20	+0.25 D	20/20	20/20
	OS	+5.50 D	20/70	20/30	+0.50 D	20/30	20/30
16	OD	+5.00 D	20/80	20/20	Plano	20/20	20/20
	OS	+5.50 D	20/80	20/20	Plano	20/20	20/20
17	OD	+5.50 D	20/70	20/20	-0.25 D	20/20	20/20
	OS	+5.50 D	20/70	20/20	Plano	20/20	20/20
18	OD	+5.00 D	20/70	20/20	+0.25 D	20/20	20/20
	OS	+4.50 D	20/70	20/20	+0.50 D	20/20	20/20
19	OD	+5.25 D	20/70	20/20	Plano	20/20	20/20
	OS	+5.00 D	20/70	20/20	Plano	20/20	20/20
20	OD	+7.50 D	20/200	20/20	+1.00 D	20/25	20/20
	OS	+8.25 D	20/200	20/20	+1.50 D	20/25	20/20

OD = right eye; OS = left eye; UCVA = uncorrected visual acuity; BSCVA = best spectacle-corrected visual acuity

size of 2 mm was used for all treatments. Epithelium was removed by alcohol delamination.

For calculation of the surgical parameters, and for identifying the correction objective, both cycloplegic and manifest refraction were used; the target correction was the maximum. spherical correction that could be given without decreasing visual acuity at distance when the patient was not cyclopleged (manifest hyperopia) and within 0.50 D of the total hyperopia in all eyes (8).

The same surgeon (A.M.) performed all procedures. The instruments and laser parameters used were identical to those used in adult patients without accommodative esotropia (9).

All surgical procedures were conducted under topical anesthesia induced by the instillation of 2% oxybuprocaine or 2% lidocaine ophthalmic solution.

A written informed consent was provided by all patients or their parents in the case of minors.

All procedures were carried out in accordance with the Declaration of Helsinki.

After laser treatment, the patients wore a corneal lens for 1 week and were medicated for 1 week with three drops daily each of netilmicin sulphate and fluorometholone, and four drops daily of sodium hyaluronate ophthalmic solution.

Postoperative examinations occurred after 1 day, 1 week, 2 weeks, 1 month, 3 months, 6 months, 1 year, 2, 3, and 4 years; postoperative visual acuity, refraction, alignment, and stereo testing were recorded for all patients. Data from the most recent evaluation are shown in this study.

Statistical evaluation was performed using *t*-test; p values below 0.05 were taken as statistically significant.

RESULTS

The mean follow-up period was 30.2 months (range 14 to 44 months). Demographic data, preoperative correction, and the type of surgical procedure are reported in Table I.

Visual acuity

Table II illustrates the data regarding visual acuity and cycloplegic refraction before and after surgery. The preoperative BSCVA was in all cases greater than or equal to 20/30. No significant difference was observed between the preoperative and postoperative mean BSCVA

TABLE III - STRABISMUS ANGLE AND STEREOPSIS BEFORE AND AFTER REFRACTIVE SURGERY OF 20 YOUNG PATIENTS WITH PURELY REFRACTIVE ACCOMMODATIVE ESOTROPIA

Patient	Preoperative					Postoperative		
	Near (UC)	Distance (UC)	Near (C)	Distance (C)	Stereopsis (Titmus test)	Near (UC)	Distance (UC)	Stereopsis (Titmus test)
1	20Δ	12Δ	10Δ	6Δ	A	(8Δ)	(6Δ)	A
2	30Δ	20Δ	12Δ	10Δ	A	(8Δ)	(6Δ)	A
3	12Δ	10Δ	6Δ	Orth	P	(6Δ)	(4Δ)	P
4	14Δ	10Δ	10Δ	Orth	A	Orth	Orth	A
5	14Δ	10Δ	8Δ	6Δ	A	Orth	Orth	A
6	20Δ	16Δ	4Δ	Orth	P	(6Δ)	(4Δ)	P
7	14Δ	10Δ	6Δ	Orth	P	Orth	Orth	P
8	16Δ	10Δ	8Δ	6Δ	A	(6Δ)	(4Δ)	A
9	25Δ	20Δ	(12Δ)	(6Δ)	A	(8Δ)	(6Δ)	A
10	14Δ	10Δ	8Δ	6Δ	A	Orth	Orth	P
11	12Δ	10Δ	8Δ	6Δ	A	Orth	Orth	P
12	14Δ	10Δ	6Δ	Orth	P	Orth	Orth	P
13	12Δ	10Δ	8Δ	6Δ	P	Orth	Orth	P
14	18Δ	16Δ	12Δ	10Δ	A	(6Δ)	(4Δ)	A
15	20Δ	18Δ	(6Δ)	Orth	P	(6Δ)	Orth	P
16	18Δ	16Δ	Orth	Orth	P	(6Δ)	(4Δ)	P
17	20Δ	10Δ	10Δ	Orth	P	Orth	Orth	P
18	30Δ	20Δ	20Δ	10Δ	A	(8Δ)	(6Δ)	A
19	20Δ	20Δ	10Δ	Orth	A	(6Δ)	Orth	A
20	20Δ	16Δ	6Δ	6Δ	A	(6Δ)	(6Δ)	A

UC = uncorrected; C = corrected; D = prismatic diopters; (Δ) = esophoria; Orth = orthophoria; A = absent; P = present

(p=0.32). Furthermore, there was no statistically significant difference between the mean preoperative BSCVA and the postoperative UCVA (p=0.32). No eye lost a Snellen line of visual acuity.

Refraction

The mean preoperative cycloplegic refraction (spherical equivalent [SE]) was +4.72 D (range +2.25 to +8.25; standard deviation [SD] 1.34). Postoperatively, the mean cycloplegic refraction was +0.2 0D (range –0.25 to +1.50; SD 0.35). The difference between these two arithmetic means was highly statistically significant (p<0.001). The mean correction obtained with an excimer laser procedure was 4.62 D (range +2.25 to +7.75; SD 4.52). Twenty-five eyes (62.5%) become emmetropic after refractive surgery; 36 eyes (90%) were within ±0.50 D of emmetropia and 39 eyes (97.5%) were within ±1.00 D.

Alignment outcome

Table III reports the results obtained on this treatment of ocular alignment and stereopsis.

All 20 patients (100%) demonstrated a decrease in esodeviation, or converted from esotropia to esophoria after refractive surgery. Reduction of incorrect esotropia after surgery ranged from 12Δ to 30Δ at near, and from 10Δ to 20Δ at distance. After refractive surgery, 10 patients (50%) showed esophoria for both distance and near vision, 2 patients (10%) esophoria only for near vision, and 8 patients (40%) orthophoria for both distance and near vision. The mean preoperative deviation without correction was 18.1Δ (range 12 to 30; SD 5.4) for near vision and 13.7Δ (range 10 to 20; SD 4.3) for distance vision. After LASIK or PRK, the average deviation was 4Δ esophoria at near (range orthophoria to 8Δ esophoria) and 2.5Δ at distance (range orthophoria to 6Δ esophoria): a deviation of 0 implies that only esophoria was present. The difference between the mean ocular deviation without correction pre- and postprocedure was statistically significant for both near and distance vision (p<0.001 in both cases).

The mean preoperative angle of deviation with correction was 7.6Δ (range 0 to 20; SD, 4.7) for near vision and 3.6Δ (range, 0 to 10; SD 3.9) for distance vision. No significant difference was observed between the preoperative mean strabismus angle with correction and the postoperative mean strabismus angle without correction at near and at distance (p<0.001 in both cases).

TABLE IV - COMPARISON OF THE PRESENT STUDY WITH PREVIOUS STUDIES ON EXCIMER LASER TREATMENT OF REFRACTIVE ACCOMMODATIVE ESOTROPIA

	Hoyos et al (6)	Stidham et al (3)	Nucci et al (8)	Phillips et al (7)	Farahi et al (5)	Sabetti et al (4)	Present study
Year	2002	2002	2003	2004	2005	2005	2007/2008
No. of patients	9	27	8	15	10	18	20
Mean age at treatment, yrs	28	33.3	24.6	13.9	24.3	32.4	18.8
Surgical technique	LASIK	LASIK	PRK	LASIK	LASIK	LASIK + PRK	LASIK + PRK
Follow-up time, mo	20	Minimum 6	12	15, 7	12	24	30.2
Mean cycloplegic refraction (SE)							
Preoperative	5.01D	7.30D	3.70D	5.35D	5.03D	6.46D (LASIK) 4.60 (PRK)	4.73D
Postoperative	0.06D	2.1D	0.7D	2.43D	1.68D	Plano (LASIK) 0.17 (PRK)	0.2D
Mean strabismus angle of tropia							
Preoperative near vision	36Δ	9Δ	10.75Δ	NR	37.1Δ	13.4Δ (LASIK) 14.4Δ (PRK)	18.1Δ
Preoperative distance vision	36Δ	NR	NR	NR	NR	11.5Δ (LASIK) 11.6Δ (PRK)	13.7Δ
Postoperative near vision	0Δ	3.3Δ	0Δ	NR	7.2Δ	0Δ	(4Δ)
Postoperative distance vision	0Δ	NR	NR	NR	NR	0Δ	(2.5Δ)

D = prismatic diopters; NR = not reported; (Δ) = esophoria

Sensory outcome

Before refractive surgery, 8 patients (40%) demonstrated gross stereopsis using Titmus test; postoperatively, 10 patients (50%) demonstrated stereopsis using the same test. No patient with preoperative stereopsis lost stereopsis postoperatively (Tab. III).

Complications

No complications were observed intraoperatively or postoperatively. There were no cases of corneal haze, infection, decentered ablation, or unexpected refractive results. All patients conveyed their satisfaction with the results obtained with regards to function and aesthetics.

DISCUSSION

In the last decade, the treatment of fully refractive accommodative esotropia with excimer laser has been confirmed a valid alternative to the use of eyeglasses or contact lenses. Its success originates from the theory that this type of strabismus is caused by refractive error. These patients have insufficient divergence amplitudes to overcome the convergence associated with the accommodation required to provide the retina with a clear image. Correction of the refractive error thus reduced the accommodative demand, and therefore convergence. Various studies, especially recently, have confirmed these expectations (3-8), obtaining good results in terms of improving the angle of strabismus via precise correction of refractive error with LASIK (3-7) or PRK (4, 8).

Stidham et al examined 27 patients aged between 10 and 52 (mean 33.3 years) who underwent LASIK, all under local anesthesia. Mean preoperative refraction was 7.30 D, and postoperatively the mean was 2.1 D. Five eyes (10%) lost two lines of BSCVA, 6 eyes (13%) lost one line, and 29 eyes (60%) had no change. The mean uncorrected esotropia was significantly reduced from 9.0Δ before surgery to 3.3Δ after surgery. The authors conclude that LASIK is safe and effective in reducing the mean uncorrected esotropia (3).

Sabetti et al examined 18 patients aged between 21 and 52 (mean 32.4 years): 8 patients underwent PRK and 10 LASIK. The mean follow-up was 24 months. Mean preoperative refraction was 6.46 D (LASIK) and 4.60 D (PRK), and postoperatively the mean was plano (LASIK) and 0.17 D (PRK). Five out of 14 patients gained one or more lines of vision; no patient lost any. The correction of the refractive error with excimer laser allowed a reduction of the angle of deviation in all but one patient, who presented with a regression of refractive error and of the angle of deviation 2 years post-treatment. The authors conclude that both PRK and LASIK can be performed safely and effectively to correct fully refractive accommodative esotropia (4).

Farahi et al report their experience in refractive esotropia treated by LASIK on 10 patients (mean age 24.3 years). The mean follow-up was 12 months. The mean preoperative refraction was 5.03 D, mean postoperative refraction was 1.68 D. Of 20 eyes, 15% lost one line of BSCVA, 10% gained two lines, and 75% showed no change. The mean uncorrected esotropia was significantly reduced from 37.1Δ before surgery to 7.2Δ after surgery. Thus the therapy was safe and effective (5).

Hoyos et al used LASIK to treat refractive accommodative esotropia in nine patients (mean age 28); the follow-up was 20 months. Mean preoperative refraction was 5.01 D and mean postoperative refraction was 0.06 D. Mean preoperative angle of ocular deviation was 36Δ; after surgery all patients were orthotropic. The authors conclude that LASIK therapy was effective and save (6).

Phillips et al used LASIK for high hyperopia in 15 awake, autofixating pediatric and adolescent patients with fully or partially accommodative esotropia. The mean preoperative refraction was 5.35 D, mean postoperative refraction was 2.43 D. The mean follow-up was 15.7 months. Seven patients (47%) required enhancement due to undercorrection of hyperopia with diplopia (6 patients) or astigmatism with decreased visual acuity (1 patient). In this small series, no patient lost best-corrected visual acuity or stereo acuity. In conclusion, LASIK can safely and effectively reduce refractive error in this group of patients; however, patient selection is critical (7).

Nucci et al used PRK to treat purely refractive accommodative esotropia in eight patients (mean age 24.6); the follow-up was 12 months. Mean preoperative refraction was 3.70 D and mean postoperative refraction was 0.7 D. Mean preoperative angle of ocular deviation was 10.75Δ; after surgery all patients were orthotropic. The authors conclude that photorefractive keratectomy was an effective treatment for esotropia associated with mild to moderate hyperopia in young adults with purely refractive accommodative esotropia (8).

All these studies have provided further evidence of its efficacy and safety, with respect to earlier reports that involved small numbers of patients (10, 11). The present study differs from others because it is based on a larger series of patients. Comparison of the present with previous studies on excimer laser treatment of refractive accommodative esotropia is reported in Table IV.

Our study confirms the success of the treatment of refractive accommodative esotropia with excimer laser: 20 patients out of 20 (40 eyes) reduced the angle of strabismus following LASIK (17 patients) or PRK (3 patients).

According to Sabetti et al (4), we believe that the decision to treat only patients with reduced esotropia after the continuous use of contact lenses for 30 days allowed us to obtain better results than Stidham et al. In fact, Stidham et al included patients with partially or no refractive accommodative esotropia in their study (3).

With regards to visual acuity, the UCVA in all eyes improved after treatment, and unlike what was reported by other studies (3, 5), none of our patients lost any Snellen line of vision. Another difference with these two studies was the mean postoperative cycloplegic refraction, which for our patients was 0.18 D, in contrast to Stidham et al's and Farahi et al's patients (2.1 D and 1.68 D, respectively).

One substantial difference between our study and previous studies was the relatively low mean age of our patients (Tab. I). This choice to treat even adolescent patients was based on experience (12, 13) that sustains the relative stability of hyperopia in the passage from adolescence to adulthood. Raab (14) confirmed in his study of patients with accommodative esotropia that until age 7, hyperopia increases, from 7 to 13 years of age, it diminishes rapidly, followed by a slow decline until 20 years of age, after which time, it remains unvarying. Furthermore, numerous studies (3, 7, 15-24) indicate that excimer laser procedures are safe in children, even if some reported cases (15, 17, 19-24) were performed under general anesthesia. In particular, Philips et al (7) reported no serious complications in 15 patients operated under local anesthesia, with an age range from 9.1 to 18.8 years (mean age 13.9 years).

Postoperative changes in stereopsis were observed in two of our patients (10%), as was reported in a previous study by Stidham et al (3). Conversely, some patients of the Nucci et al study did not complain of stereoacuity changes (8).

Since the PRK treatment was performed only in three patients, we could not statistically compare the two techniques. Nevertheless, both procedures provided good results and no complications, as was also reported by Sabetti et al (4).

Another noticeable difference between this and previous studies was the duration of follow-up, which was a mean of 30.2 months.

In conclusion, this study confirms the efficacy and safety of treatment of fully refractive accommodative esotropia with excimer laser, even in adolescent patients. We recommend use of this procedure in young adult patients with esotropia associated with a stable, mild to moderate hyperopia.

Additional studies need to be completed to increase the patient experience and to extend the time of follow-up for evaluation of the stability of the long-term results obtained with these procedures and to determine whether refractive surgery in pediatric or adolescent patients is safe over the lifetime.

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