

## Hyperopic LASIK in pediatric ophthalmology

Merab Dvali, Eter Mshvidobadze, Nana Tsintsadze, Bella Sirbiladze, Sophia Mirtskhulava

Department of Ophthalmology, Tbilisi State Medical University, Georgia

### ABSTRACT

Refractive errors' correction is a purpose of excimer laser surgery (LASIK). LASIK is primary indication for hyperopic children with anisometropia with high astigmatism when impossibility correct' on with glasses or contact lenses leads to amblyopia or strabismus development. 63 eyes of 46 patients underwent excimer laser refractive surgery over a 6 year period. Patients underwent a complete ophthalmic examination including systemic work-up. Laser correction was based on the full cycloplegic refraction to avoid residual hyperopia postoperatively. Preoperative uncorrected visual acuity (UCVA) ranged from 0,04 to 1,0; preoperative best spectacle-corrected visual acuity (BSCVA) - from 0,1 to 1,0; postoperative UCVA - from 0,3 to 1,0. Postoperative UCVA was heater that preoperative BSCVA in 44 (70%). The degree of amblyopia decreased in 24 cases, and disappeared 20 cases. Excimer laser correction of hyperopia and hyperopic astigmatism in children and adolescents not only aims to correct refractive errors, but to improve visual functions in amblyopia cases, correct accommodative strabismus as well as form full-value binocular vision.

**KEYWORDS:** hyperopic LASIK, astigmatism, amblyopia, strabismus, children

**A**s a rule, refractive errors' correction is a purpose of excimer laser surgery. At the same time, in some cases, laser correction is primary indication for hyperopic children with anisometropia with high astigmatism, when impossibility of full-value correction with glasses or contact lenses leads to amblyopia or strabismus development.

Supposing positive dynamics, we especially concentrated on results of laser procedure in children and adolescents with accommodative strabismus and refractive amblyopia.

We considered that the performance of laser operation is permissible in the age mentioned above, due to anatomic-functional parameters of the eye is basically completed at the age of 7-8, a from the clinical point of view, this age still enables effectively treat amblyopia and strabismus.

### MATERIALS AND METHODS

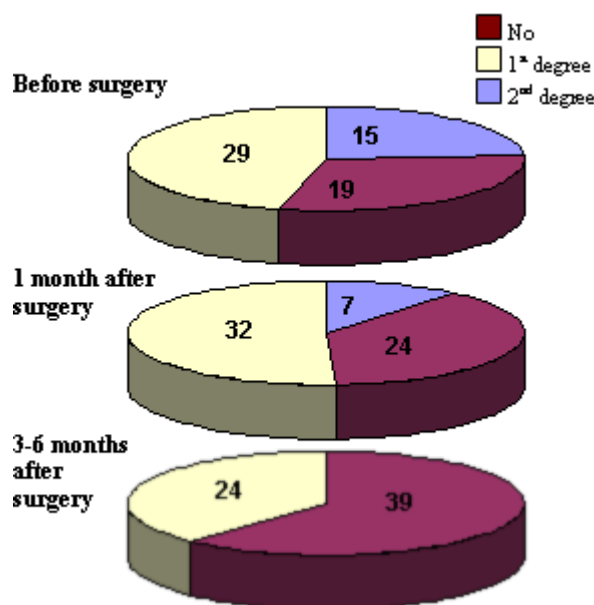
63 eyes of 46 patients underwent excimer laser refractive surgery over a 6-year period. Mean patient age was  $12,65 \pm 2,1$  years (range: 8 to 16 years). Spherical equivalent refraction (SE) ranged from +1,0 to +6,0 diopters (D) end astigmatism ranged from 1,0 to 5,5 D. Mild to moderate (I-II degrees, respectively) amblyopia was present in 44 eyes, the angle of deviation ranged from  $10^\circ$  to  $45^\circ$  in 30 patients, and disruption of binocularity was seen in 24 cases.

Patients underwent a complete ophthalmic examination including systemic work-up. Pre- and postoperative ophthalmic examinations included uncorrected visual acuity (UCVA), manifest and cycloplegic refractions, keratometry, slit-lamp microscopy, and corneal topography using the OPD-Scan (NIDEK, Gamagori, Japan). Postoperative examinations were performed at 1, 3, 6, and 12 months. Laser correction was based on the full cycloplegic refraction to avoid residual hyperopia postoperatively. LASIK was performed in all cases.

### RESULTS

Preoperative UCVA ranged from 0,04 to 1,0. Preoperative best spectacle-corrected visual acuity (BSCVA) ranged from 0,1 to 1,0. Postoperative UCVA ranged from 0,3 to 1,0. In this patient population, vision stabilized 3 to 6 months postoperatively. Postoperative UCVA was better that preoperative BSCVA in 44 (70%) of 63 eyes. In this group of eyes, the degree of amblyopia decreased in 24 cases and disappeared in 20

cases (Fig.1). It should be noted that no other form of amblyopia therapy was initiated on any patient during this study. For patients with strabismus, the angle of deviation was significantly reduced or eliminated by 3 to 6 months postoperatively (Fig.2). Twenty-one patients achieved binocularity 3 to 6 months postoperatively (Fig.3).

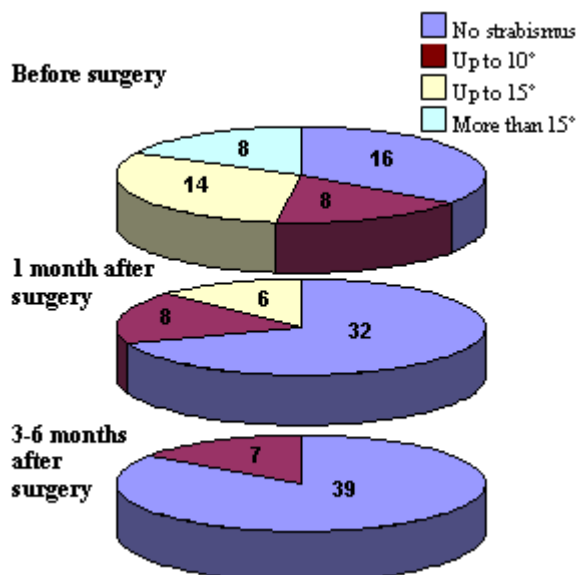


**Fig.1** Amblyopia (63 eyes).

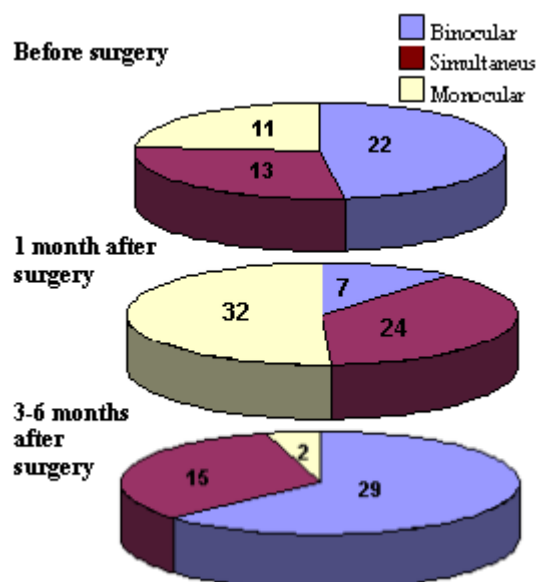
### DISCUSSION

The results of this study show that the indications of excimer laser correction of hyperopia and hyperopic astigmatism can be expended to include children with refractive amblyopia and strabismus. In some cases, excimer laser surgery is a viable and perhaps warranted intervention for children and adolescents at risk for ambliopia [6,7].

Agreed the common opinion concerning that anatomic-functional parameters of the eye are basically formed at an early school age, the children had been under observation during 6-12 months before the operation, on purpose to reveal any refraction changes. Children's psycho emotional status as well their intellectual abilities, especially under age of 10-12, were taken into consideration.



**Fig.2** Angle of deviation (46 patients).



**Fig.3** Type of vision (46 patients).

LASIK correction can be recommended on purpose not only to correct refraction error but to prevent possible development of amblyopia in case of high anisometropia with expressed astigmatism, when refraction can't be properly corrected with glasses (due to anisometropia) or contact lenses (due to high astigmatism).

The most interesting part of the study presents adolescents with amblyopia. It was observed the positive dynamics of UCVA after the operation. In our opinion, with an action of excimer laser to the cornea creates integrate optical system without glasses or contact lenses, which resulted in the perfect optical image on the retina and benefit for realization of existed potentialities of the eye.

The angle of deviation after LASIK procedure was changed in the same way (was not observed or was insignificant) as with optimal optical correction. Moreover,

it was observed the positive dynamics of strabismus in cases with residual angle of deviation together with improvement of visual functions leading to amblyopia decrease.

As for the type of vision, in some cases it was monocular or simultaneous. Some of the patients with high amblyopia and big angle of deviation have monocular or simultaneous vision even with glass correction. Monocular or simultaneous vision was changed on binocular one after the operation.

#### CONCLUSION

Excimer laser correction of hyperopia and hyperopic astigmatism in children and adolescents not only aims to correct refractive errors, but to improve visual functions in amblyopia cases, correct accommodative strabismus as well as form full-value binocular vision.

#### REFERENCES:

1. Mulvihill A., McCann A., Flitcroft I., O'Keefe M. Outcome in refractive accommodative esotropia // Br. J.Ophthalmol.-2000.-Vol.84.-No.7.P746-740.
2. Lesueur L., Chapotot E., Arne J.L., Perron-Buscail A., Deneuve S. Predictability of amblyopia in ametropic children. Apropos Paris V., Andris C., Moutshen A. benefits of total hypermetropia correction in patients with strabismus // Am. J.Ophthalmol.-1993.-Vol.116.-No.1.-P.79-83.
3. Iacobucci I.I., Archer S.M., Giles C.L. Children with esotropia responsive to spectacle correction of hyperopia // J.Pediatr. Ophthalmol. Strabismus.-1993.-Vol.30.-No.3.-P. 167-70.
4. Chen. Y., Zhu X., Liu W. Lasik for high and moderate hyperopia // J. Refract Surg.-2000.-Vol.18.-No. 1. -P.30-36.
5. Lambert S.R. Accommodative esotropia // JAAPOS.-2001.- Vol.5. -No.4.-P.246-249.
6. Raab E.L. Follow-up monitoring of accommodative esotropia // Trans. Am. Ophthalmol. Soc.-2000.- P.71-76.
7. Weikley D.R. Jr., Birch E. The role of anisometropia in the development of accommodative esotropia // Ophthalmologica.-2000.-Vol.214.- No.5.- P 309-311.

## Применение гиперметропического ЛАСИКа в педиатрической офтальмологии

Мераб Двали, Этер Мивидобадзе, Нана Цинцадзе, Белла Сирбиладзе, София Мирицхулава

Кафедра офтальмологии Тбилисского государственного медицинского университета, Грузия

### РЕЗЮМЕ

Получение рефракционного результата является главной целью эксимерной лазерной хирургии (ЛАСИК). Манипуляции ЛАСИК - первичное показание при анизометропии с высоким астигматизмом у детей, имеющих дальнозоркость, когда очковая или контактная коррекция невозможно и существует опасность развития амблиопии или косоглазия. Операционному вмешательству подверглись 46 детей в возрасте от 8-ми до 16-ти лет. Количество оперированных глаз - 63. Пациентам проводили полную глазную экспертизу, включая системное исследование. Лазерная коррекция базировалась на полном циклоплагическом рефракции, чтобы избежать постоперационную остаточную гиперметропию. Острота зрения без коррекции (UCVA) до операций варировалась от 0,04 до 1,0; дооперационные показатели лучшей корригируемой визуальной остроты зрения (BSCVA) - от 1,0 до 1,0; послеоперационные показатели UCVA - от 0,3 до 1,0. Постоперационные UCVA были лучше дооперационных BSCVA в 44 случаях (70%). Степень амблиопии уменьшилась в 24 случаях и исчезла в 20 случаях. Применение гиперметропического ЛАСИКа не только корректирует астигматизм у детей и подростков, но и улучшает визуальные функции при амблиопии и исправляет аккомодационное косоглазие.

**Ключевые слова:** гиперметропический ЛАСИК, астигматизм, амблиопия, косоглазие, дети

---

□ International committee of medical journal editors. Uniform requirements for manuscripts submitted to biomedical journals. Ann Intern Med 1997;126:36-47.

---

### Preparation of Manuscript

The text of observational and experimental articles is usually (but not necessarily) divided into sections with the headings Introduction, Methods, Results, and Discussion. Long articles may need subheadings within some sections (especially the Results and Discussion sections) to clarify their content. Other types of articles, such as case reports, reviews, and editorials, are likely to need other formats. Authors should consult individual journals for further guidance.

Type or print out the manuscript on white bond paper, 216 x 279 mm (8.5 x 11 inches), or ISO A4 (212 x 297 mm), with margins of at least 25 mm (1 inch). Type or print on only one side of the paper. Use double spacing throughout, including for the title page, abstract, text, acknowledgments, references, individual tables, and legends. Number pages consecutively, beginning with the title page. Put the page number in the upper or lower right-hand corner of each page.

### Manuscripts on Disks

For papers that are close to final acceptance, some journals require authors to provide a copy in electronic form (on a disk); they may accept a variety of word-processing formats or text (ASCII) files.

When submitting disks, authors should:

1. be certain to include a print-out of the version of the article that is on the disk;
2. put only the latest version of the manuscript on the disk;
3. name the file clearly;
4. label the disk with the format of the file and the file name;
5. provide information on the hardware and software used.

Authors should consult the journal's instructions to authors for acceptable formats, conventions for naming files, number of copies to be submitted, and other details.

### Title Page

The title page should carry 1) the title of the article, which should be concise but informative; 2) the name by which each author is known, with his or her highest academic degree[s] and institutional affiliation; 3) the name of the department(s) and institution[s] to which the work should be attributed; 4) disclaimers, if any; 5) the name and address of the author responsible for correspondence about the manuscript; 6) the name and address of the author to whom requests for reprints should be addressed or a statement that reprints will not be available from the authors; 7) source[s] of support in the form of grants, equipment, drugs, or all of these; and 8) a short running head or footnote of no more than 40 characters (count letters and spaces) at the foot of the title page.

### Authorship

All persons designated as authors should qualify for authorship. Each author should have participated sufficiently in the work to take public responsibility for the content.

Authorship credit should be based only on substantial contributions to 1) conception and design, or analysis and interpretation of data; and to 2) drafting the article or revising it critically for important intellectual content; and on 3) final approval of the version to be published. Conditions 1, 2, and 3 must all be met. Participation solely in the acquisition of funding or the collection of data does not justify authorship. General supervision of the research group is not sufficient for authorship. Any part of an article critical to its main conclusions must be the responsibility of at least one author.

Editors may ask authors to describe what each contributed; this information may be published.