

NEODYMIUM YAG LASER ANTERIOR CAPSULOTOMY IN CONGENITAL CATARACT*

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Key words: congenital cataract, capsulotomy, laser, neodymium YAG laser

The use of lasers in performing noninvasive ophthalmic surgery has become widespread during the past ten years¹. The neodymium YAG laser (Nd: Yag laser) is an important new tool for the ophthalmologist that can be used to open the anterior capsule of the lens prior to linear extraction in congenital cataract surgery. A precise anterior capsulotomy can be performed without stressing the zonules, and allowing hydration and softening of the lens cortex which in turn tends to separate from the lens capsule more easily. This may shorten and simplify the linear extraction, but some problems are also present. After laser application, many patients develop an undesirable inflammation and an elevation in intraocular pressure. This is particularly the case when the laser is used more extensively on cortical tissue^{1,2}.

The Nd: YAG laser produces an optical breakdown by delivering more than one trillion watts of electromagnetic wave power density per square centimeter to its focal point. But these lasers act without a significant temperature change. The target need not be opaque to its wavelength (1064 nanometers). Instead of burning the tissue, it acts like a small pair of scissors within the eye. The high power density of the focal point knocks the electrons out of orbit, and creates a shock wave³.

This study consists of the first 15 congenital cataracts of patients that underwent Nd: YAG anterior capsulotomy in the Department of Ophthalmology at the Ondokuz Mayıs University Faculty of Medicine.

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Material and Methods

The primary goals of this study were to determine the safety and efficiency of this procedure. The surgeons involved in this study had previously gone through a period of laboratory training in laser applications.

The Nd: YAG laser was used on 15 eyes of 12 patients being studied. Applications were performed by the Sharplan Q-switched nanosecond Nd: YAG laser. The laserhead was mounted on a Heig-Streit slit lamp. The average power setting was 1.5 to 3.1 mJ with the average number of shots being one to ten. No contact lenses were used.

In cases of cortical opacification, only the anterior capsule is destroyed by laser with one or three shots. This procedure prevents postlaser inflammation and an elevation in intraocular pressure. The technique that we used in cases with a fairly clear or normal cortex was to make a deep cortical burst prior to opening the capsule. Approximately ten applications are made under the capsule, creating plasma vacuoles. Then the aiming beam is refocused on the anterior capsule and one or two shots are performed.

The patients' ages ranged from four months to four years with a mean of 2.2 years. There were eight males and four females. In all cases the pupilla was dilated maximally with cyclopentolate (1%) and phenylephrine (10%) prior to treatment. After the applications, atropin and corticosteroid and according to the lens material free in the anterior chamber, timolol maleate eye drops were applied.

All laser sessions are performed under ketamine anesthesia injected Intramuscularly or intravenously with an anesthesiologist always present. The eyes of our subjects were examined at the first, fourth, and twenty-fourth hour on the first day and a follow-up re-examination was necessary after one week and one month, respectively.

Results

Initial anatomic success in anterior capsulotomy was achieved in all of our cases. The largest mean diameter of the anterior capsular opening was 3 mm with a range of 1-2 mm. Corneal damage and iris bleeding were not observed. At the time of laser application, a small amount of cortex material in the anterior chamber was also seen. As shown in Table I, none of the patients showed signs of inflammation.

TABLE I: Distribution of Post-laser Inflammation

Post-laser inflammation	1 hour	4 hours	24 hours
None	15	15	15
Ciliary injection	—	—	—
Corneal edema	—	—	—

Results of ease of separation of cortex material from the lens capsule are shown in Table II.

TABLE II: Ease of Separation of Cortex Material from Lens Capsule

Case Characteristics and Laser Technique	Cortex Separated Spontaneously			Adherent Cortex	
	Cases	No.	%	No.	%
Cortical opacification 1-3 bursts open capsule	5	5	(100)	0	(0)
Clear cortex 10 bursts under anterior capsule, 1-3 bursts for anterior capsule.	10	8	(80)	2	(20)

In cases of cortical opacification only the Nd: YAG laser anterior capsulotomy was found to be successful in aspirating the lens material easily. But in cases of a clear cortex, laser bursts under the anterior capsule must be performed. In those cases, in spite of deep bursts, an adherent cortex was found in 20% of the patients (Table II).

All the patients underwent linear extraction in 30 days. Post-laser changes on the anterior capsule and lens and post-linear extraction are shown in Figs. 1-3.

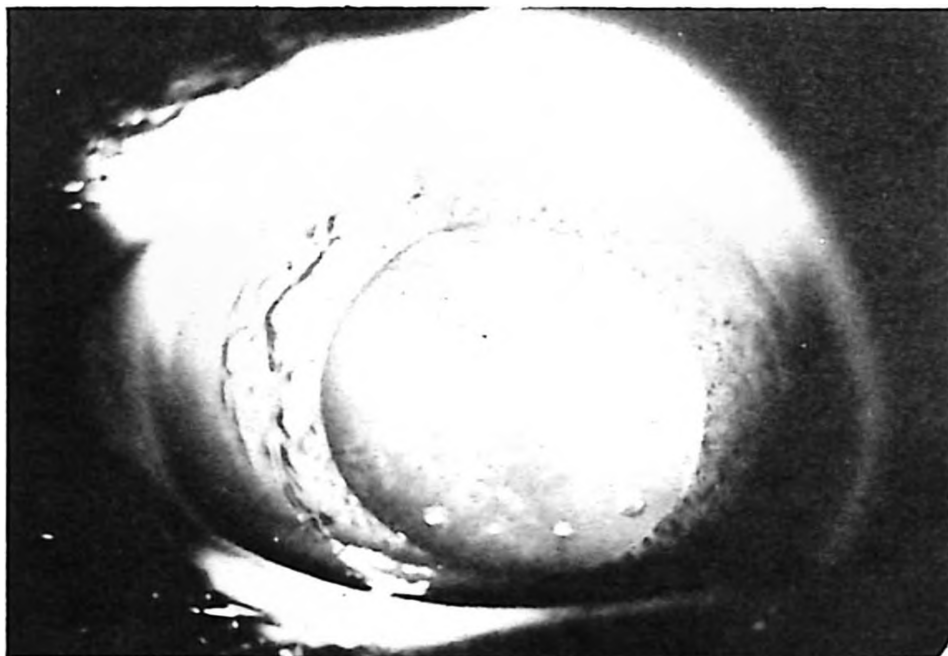


Fig. 1: Laser-induced anterior capsulotomy. One minute after laser application plasma bubbles are still present inside the lens.

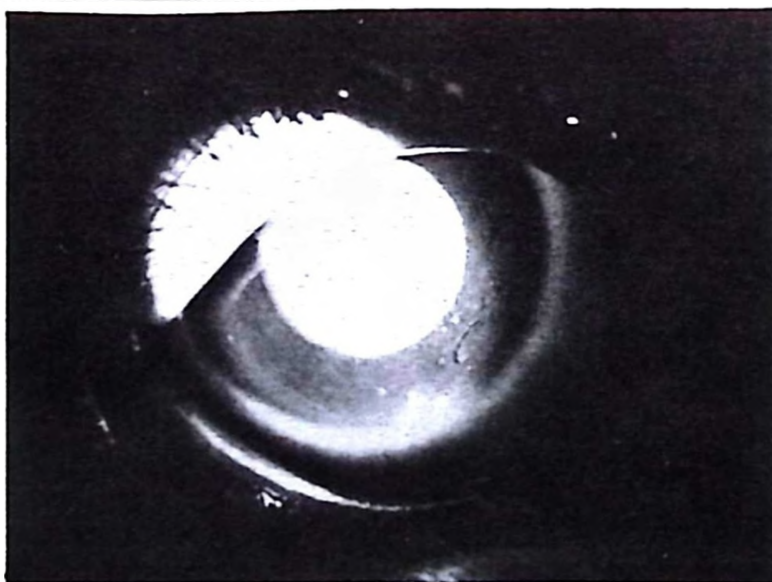


Fig. 2: Maturation of cataract seven days after laser application.

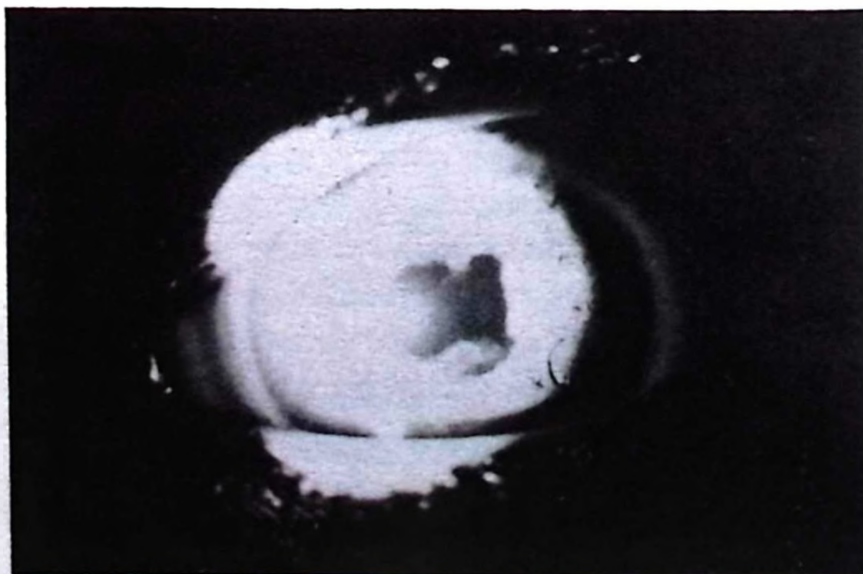


Fig. 3: After linear extraction of cataract, pupillary area is open.

Discussion

Every step of congenital cataract surgery is important and must be carried out properly. If an anterior capsulotomy is poorly performed, the zonules may be disinserted and the capsule tear may extend posteriorly which may cause a problem as the procedure progresses and also in regard to future ocular lens implantation.

The Nd: YAG laser anterior capsulotomy is an ideal procedure. The opening in the capsule can be precisely made without an instrument entering the eye and without any risk of infection. In addition there is no stress placed on the zonules, and no extensions of the capsulotomy into the posterior capsule.

Complications of Nd: YAG laser application in cataract surgery include, elevation in intraocular pressure^{4,5}, corneal endothelial damage⁶, retinal detachment⁷ and postoperative uveitis⁸.

We are convinced that since we tried to maintain exposures to a minimum in our laser applications, postoperative uveitis and an elevation in intraocular pressure were not observed in our study. In addition, it must also be considered that since a child's eye reabsorbs lens material more readily, fewer sessions are required than in adults.

Ketamine anesthesia was administered to produce sufficient akinesia for laser application and due to its rapid action all cases were outpatients.

Nd: YAG laser anterior capsulotomy is a new procedure in congenital cataract surgery, but offers many advantages over surgical discission. Undesirable associated findings can be avoided through careful and minimal laser applications and skilled operative techniques.

This is the first report of a Nd: YAG laser anterior capsulotomy in congenital cataract in Turkey. Performing this a type of surgery, without any risk of endophthalmitis occurring is a tremendous advance in medical science.

Summary

Prior to linear extraction, the anterior capsule was opened and softening of the lens was achieved in 15 eyes of 12 cases with congenital cataract by application of the Nd: YAG laser. A lower power setting and minimal shots were used. No significant side effects were observed.

REFERENCES

1. Aron-Rosa D. *Pulsed YAG Laser Surgery*. New Jersey: Slack, 1983, pp 41-43.
2. Woodward PM. Anterior capsulotomy using a neodymium YAG laser. *Ann Ophthalmol* 6:534, 1984.

3. Aron-Rosa D, Griesemann J. Use of the mechanical effects of YAG lasers by neutralization of their thermal effects. *Clin Ophthalmol* 3:47, 1980.
4. Parker WT, Clorfeine GS, Stocklin RD. Marked intraocular pressure rise following Nd:YAG laser capsulotomy. *Ophthalmic Surg* 15:103, 1984.
5. Ruderman JM, Mitchell PG, Kraff M. Pupillary block following Nd:YAG laser capsulotomy. *Ophthalmic Surg* 14:418, 1983.
6. Deutsch AT, Goldberg FM. Nd:YAG laser capsulotomy. *Int Ophthalmol* 3:87, 1985.
7. Fastenberg DM, Schwartz PL, Lin HZ. Retinal detachment following neodymium-YAG laser capsulotomy. *Am J Ophthalmol* 97:288, 1984.
8. Gardner KM, Straatsma BR, Pettit TH. Neodymium:YAG laser posterior capsulotomy: the first 100 cases at UCLA. *Ophthalmic Surg* 1:24, 1985.