

Visual Outcome after Nd-YAG Capsulotomy in Posterior Capsule Opacification

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Purpose: To find out the immediate visual outcome after performing Nd-YAG laser capsulotomy for posterior capsular opacification (PCO) in adults.

Materials and Methods: After thorough prelaser assessment, Nd-YAG laser capsulotomy was carried out with Zeiss VISULAS YAG II through Zeiss slit lamp under topical anaesthesia for 58 eyes with PCO in 58 patients. Postlaser visual acuity (VA) compared to preoperative VA was noted. Associated comorbidities were also noted.

Results: Of the 58 patients, 39 (67.2%) were male and 19 (32.8%) were female. Nine (15.5%) were aphakic and 49 (84.5%) were pseudophakic. The average age was 52 years (Range 18 years to 83 years). The average time interval between cataract surgery and Nd-YAG laser capsulotomy was 23 months (2 months to 12 years). Capsular fibrosis (62%) was the predominant type of PCO. Elschnig's pearls were present in 20.7% and capsular wrinkling found in 15.5%. All these capsulotomies were performed for optical purposes and the results were rewarding. The pre laser VA of more than 70% of eyes was 6/36 or below while 44.8% had VA of hand movements or finger count. Visual acuity of 6/18 or better was achieved in 60.2% of eyes while 12.0% recovered to 6/9 and 3.4% achieved 6/6. None of these eyes showed further deterioration in VA.

Conclusion: Neodymium-YAG capsulotomy for PCO is rewarding procedure in adults and visual outcome is good. Comorbidities may reduce the better visual outcome.

Since the recognition of cataract, its removal was recommended and practiced in the ancient era. As the evolution of cataract surgery continued from couching, preliminary techniques of extracapsular cataract extraction to intracapsular cataract extraction, high incidence of complications after intracapsular cataract extraction such as vitreous loss, cystoid macular oedema and retinal detachment, triggered the search for perfection. In the last two decades resurgence of refined techniques of extracapsular extraction, not only reduced the rate of

complications but also, intact posterior capsule encouraged implantation of posterior chamber intraocular lens (IOL) for attaining better visual results. Since the development of extracapsular cataract extraction and phacoemulsification and adaptation of the procedure as being the standard one globally, its after effects are studied meticulously. After cataract (PCO) is a natural consequence of extracapsular cataract extraction and phacoemulsification. Overall incidence of 25% has been reported for PCO after extracapsular cataract extraction within

5 years of surgery¹. As a result of this opacification, there is gradual deterioration of visual function which ultimately become symptomatic in the form of decreased VA, decreased contrast sensitivity, glare or even monocular diplopia^{2,3}. The PCO develops in months to years postoperatively. In younger age groups it develops earlier but in elderly, its incidence declines⁴. Since the use of Neodymium-YAG laser for posterior capsulotomy, this procedure has been gradually replacing the surgical capsulotomy⁵ as it is less invasive, safe and can be performed as an outpatient procedure. Size of capsulotomy should be according to the purpose of the procedure. Optical purposes need 2-3mm while therapeutic need large size capsulotomy. It should be noted that capsular opening created with Neodymium-YAG laser tends to increase in size with smoothing of edges from capsular tag retraction and may become circular^{6,7}.

Our study was designed to find out different types of PCO, time interval between surgery and development of visually significant PCO and immediate visual outcome in terms of VA after Neodymium-YAG laser capsulotomy in pseudophakia or aphakia

MATERIAL AND METHODS

All patients who were previously operated for cataract by routine ECCE or Phaco emulsification with or without intraocular lens and presented to Department of Ophthalmology, Khyber Teaching Hospital, Peshawar from October 1998 till 1999, with after cataracts (PCO) were randomly included in this study. All patients who required capsulotomy for therapeutic purposes were excluded. Patients with thick posterior capsule where we thought that YAG laser capsulotomy would not be possible but would need surgical intervention were also excluded from our study. The extent of PCO needing laser capsulotomy was determined clinically and by its functional impairment and symptoms of patients. After thorough history, all patients were evaluated clinically. After recording VA (Snellen's), evaluation by torch, slit lamp, funduscopy and applanation tonometry (Goldman's) was carried out. The type and extent of PCO was carefully noted after pupil dilation. VISULAS YAG II (ZEISS) Neodymium-YAG laser for laser capsulotomy. The red 4 point Diode laser beam was used for accurate aiming and focusing of the invisible therapeutic beam. The parameters of laser system were adjusted accordingly to the needed of patients depending upon the type and extent of PCO. As capsulotomy was done for optical purpose its

size was restricted to 2 - 3 mm in diameter. After laser capsulotomy, the patients were rest given for 1 hour. Postlaser evaluation was carried out. Topical fluorometholone (FML eye drops) was advised four times daily. If intraocular pressure (IOP) was found raised then topical beta-blocker was advised. After control of IOP and inflammation, final corrected postlaser VA was recorded on next morning.

RESULTS

We used the Neodymium-YAG laser to perform posterior capsulotomies on 58 eyes of 58 patients that had undergone extracapsular cataract extraction. Thirty nine (67.2%) of our cases were male and 19 (32.8) were female. The average age of these patients was 52 years, ranging from 18 years to 83 years. Of the 58 eyes, 49 (84.5%) had implanted posterior chamber IOL, while 9(15.5%) eyes were aphakic. The time period between cataract extraction and opacification of the posterior capsule and performing Neodymium-YAG laser capsulotomy ranged from 2 months to 12 years. The posterior capsulotomy was performed on average of 23 months after cataract extraction. The time period between cataract surgery and laser capsulotomy is shown in (Table 1).

Types of posterior capsule opacification in our study is shown in (Table 2).

The average pulse energy used for Neodymium-YAG laser posterior capsulotomy was 1.9 mj (milli joules) ranging from 0.9 to 6.5 mj. The energy was delivered as single pulse per burst and number of pulses required to produce appropriate size of capsulotomy were at average 16, ranging from 4 to 71 pulses. Capsulotomy was completed in all of these cases in single session and the total energy used at average was 87 mj, ranging from 10.4 mj to 566 mj.

The results of prelaser VA and immediate postlaser VA are compared in Table 3. It shows that majority of patients (70.6%) had VA of 6/36 or less before capsulotomy. Among these 70.6% patients, 44.8% had VA of less than 6/60 ranging from hand movement to counting of fingers. The VA after Neodymium-YAG laser capsulotomy showed dramatic improvement as shown in (Table 3). Visual acuity was improved by one or more snellen's lines in 51 (88%) out of 58 eyes. Thirty-five (60.3%) patients recorded VA of 6/18 or better. It was also observed that no one had further deterioration of VA after Neodymium-YAG laser capsulotomy.

There was no improvement in the VA after laser treatment in seven eyes. Comorbidities found in these 7 (12%) eyes causing limited or no visual improvement after Neodymium-YAG laser capsulotomy in our patients are shown in (Table 4). Immediate postlaser complications are enumerated in (Table 5).

DISCUSSION

Since the introduction of refined techniques of extracapsular cataract extraction and popularity of the phacoemulsification, opacification of the posterior capsule has become the commonest cause of postoperative reduction in vision following cataract removal⁸. The Neodymium-YAG laser has become popular non-invasive technique of creating a posterior capsulotomy in both aphakic and pseudophakic eyes. Its safety and efficacy can be argued but it has established its place as a standard treatment for PCO replacing surgical capsulotomy^{5,9-12}.

Table 1: Time period between cataract extraction and Nd: YAG laser capsulotomy (n = 58)

Time period	No of Eyes n (%)
Less than 6 months	4 (6.9)
6 months to 1 year	10 (17.2)
1 year to 2 years	18 (31.0)
2 years and above	26 (44.8)

Table 2: Types of posterior capsule opacification (n = 58)

PCO	No of patients n (%)
Capsular fibrosis	36(62.0)
Elschnig's Pearls	12 (20.7)
Capsular wrinkling	9 (15.5)
Pigmentary deposits on capsule	1 (1.7)

PCO = Posterior capsule opacification

Table 3: VA before and after Nd: YAG laser capsulotomy (n = 58)

VA	Prelaser n (%)	Postlaser n (%)
Less than 6/60	26 (44.8)	4 (6.9)
6/60	5 (8.6)	4 (6.9)
6/36	10 (17.2)	7 (12.0)
6/24	6 (10.3)	8 (13.8)
6/18	7 (12.0)	16 (27.6)
6/12	3 (5.1)	10 (17.2)
6/9	1 (1.7)	7 (12.0)
6/6	0	2 (3.4)

Table 4: Comorbidities Noted after Nd: YAG laser capsulotomy

Comorbidities	No of patient's n (%)
Diabetic Retinopathy	3 (5.17)
Age Related Maculopathy	2 (3.44)
Traumatic Maculaopathy	2 (3.44)

Table 5: Immediate complications after Nd: YAG laser capsulotomy (n = 58)

Complications	No of Eyes n (%)
Raised intra ocular pressure	48 (82.7)
Damage to intra ocular lens	13 (22.4)
HypHEMA	1 (1.7)
Rupture of anterior vitreous face	8 (13.8)
Herniation of vitreous into anterior chamber	4 (6.9)
Anterior uveitis	1(1.7)
Opacities/debris in anterior chamber	10 (17.2)
Macular oedema	1 (1.7)

In our study out of 58 patients, 39 were male (67.2%) and 19 were female (32.8%). Which probably reflects that female population less commonly undergo surgery for cataract or present to hospital for

their reduced vision after surgery. As female population in our area are socio-economically dependant on male population and also they have nearly all activities within the premises of the house, therefore reduced VA either due to immature cataract or PCO after cataract surgery, is not much significant. Tayyab and colleagues have found sex ratio as 60% vs 40% in one group of patients and 50% vs 50% in second group of their study³⁰. Hasan, et al also have reported almost the same sex ratio⁴. Opacification of posterior capsule is the commonest complication of extracapsular cataract extraction occurring more frequently in younger age group ranging from 1.5%¹³ and 4%¹⁴ in adults to 92% in children¹⁵. The time period between cataract extraction and performing Neodymium-YAG laser capsulotomy at average was 23 months in our study while it was reported as 2.49 years by Hasan et al⁴, and 24 months in another national study¹⁵. The relative incidence of different types of PCO showed that the capsular fibrosis was the predominant type of PCO as compared to Hasan, et al who reported Elschnig's pearls in pseudophakic and secondary fibrosis in aphakic eyes⁴. The main mechanism of postoperative PCO is proliferation and migration of lens epithelial cells onto the posterior capsule. Equatorial epithelial cells undergo fibrous metaplasia, causing fibrosis of posterior capsule. While Elschnig pearls formation, is due to anterior subcapsular epithelium migration on to the posterior capsule and appear like bladder cells^{16,17}. There was dramatic improvement in VA on snellen chart, after Neodymium-YAG laser capsulotomy, i.e. 60.2% of patients recorded VA of 6/18 or better in our study. It was also noted that there was no further deterioration of VA in any case. And in 51 (88%) out of 58 patients, the VA improved to one or more snellen lines. In the study conducted by Hasan, et al, improvement of VA after Neodymium-YAG laser capsulotomy on snellen chart was, 1-3 lines in 42 out of 86 patients, 4-6 lines in 31 out of 86 patients and there was no improvement of VA in 13 cases due to comorbidities⁴. A similar study reported before showed improvement of VA of one or more snellen's lines in 56 out of 63 eyes¹⁵. In an other study conducted by Wilkins et al, there was VA improvement in 7 out of 17 patients under non glare conditions, and under glare conditions 10 patients showed increase in the VA¹⁸. A study conducted by Latif and Aasi, using Neodymium-YAG laser for membranectomy recorded improvement in the VA, from 16.66% of patients prelaser to 72.22% of patients (postlaser) in the range 6/36 or better on snellen chart¹⁹. Over all 87.5% showed improvement in the

VA of an average of three lines on snellen chart after laser treatment in their study¹⁹. In study by Panezai MN and colleagues, Pre laser VA was between hand movements and 6/36 in 80% of cases and postlaser VA attained was between 6/18 and 6/6 in 91% of cases²⁹. All of these studies reported there was definite improvement in VA in high percentage of patients after Neodymium-YAG laser treatment and no one has reported deterioration of VA after laser treatment. Neodymium-YAG laser use has been accepted as standard technique for treating PCO⁵ resulting in rapid visual improvement²⁰⁻²² and so was found in study.

Complications which we encountered in our study such as raised IOP, damage to IOL, disruption of anterior vitreous face, cystoid macular edema etc are all recognized complications of Neodymium-YAG capsulotomy and had been reported previously²³⁻²⁸.

CONCLUSION

The posterior capsule opacification is a common complication after cataract surgery worldwide and it can be managed safely as an outdoor procedure by Neodymium-YAG laser posterior capsulotomy. Its indications are similar to indications for cataract surgery. In our patients the indications were optical but it can be performed for therapeutic purpose. Other possible causes responsible for dimness of vision should be excluded before predicting visual outcome. Patients of axial myopia, retinal degeneration and pre-existing glaucoma should be properly evaluated and capsulotomy if necessary, performed with care. Capsulotomy with Neodymium-YAG laser should not be performed in uncooperative and patients who cannot maintain a steady position on slit lamp. Patient education is of vital importance in this procedure. His confidence and co-operation is of great value in performing the procedure.

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