

# Complications of Nd: YAG Laser Capsulotomy

Bilal Khan, Mumtaz Alam, Mir Ali Shah, Bilal Bashir, Asif Iqbal, Adnan Alam

*Pak J Ophthalmol 2014, Vol. 30 No. 3*

See end of article for authors affiliations

Correspondence to:  
**Mumtaz Alam**  
House No 310, street 5,  
Sector E-4, phase 7  
Hayatabad Peshawar  
E-mail:  
drumtazalam@gmail.com

**Purpose:** To evaluate the complications of Nd: YAG laser capsulotomy.

**Material and Methods:** It was a prospective study conducted from May 2012 to May 2013 at Khyber Eye Foundation Peshawar. 437 eyes of 406 patients were included in the study. Before performing YAG laser detailed history was taken and complete ocular examination was performed. A consultant ophthalmologist performed all YAG laser capsulotomies. Follow up was done at 1 day, 1, 2 and 4 weeks. Detail eye examination was performed at each visit to look for any complications.

**Results:** Out of the 406 patients 189 (46.55%) were male and 217 (53.44%) were female. Mean age of the patients was 56.7 years. A variety of complications were noted after YAG laser capsulotomy. Intraocular lens pitting was the most common complication seen in 56 eyes (12.81%). Transient rise of intraocular pressure was seen in 38 eyes (8.69%) and cystoid macular edema was seen in 17 eyes (3.89%). Serious complications such as retinal detachment and endophthalmitis were seen in 2 eyes (0.45%) and 1 eye respectively (0.22%).

**Conclusion:** A number of complications can occur after Nd: YAG laser capsulotomy. The most common of these complications are intraocular lens pitting, transient intraocular pressure elevation and cystoid macular edema.

**Key words:** Intraocular lens, Capsulotomy, Cystoids macular edema.

Cataract is responsible for over half of blindness worldwide.<sup>1</sup> Cataract surgery is the most commonly performed ocular surgery. Posterior capsule opacification (PCO) is one of the most common late complications of cataract surgery.<sup>2</sup> In one study the frequency of PCO after cataract surgery was 1.6%, 12.3% and 26.5% at 1, 2 and 3 years respectively.<sup>3</sup>

PCO results from migration and proliferation of residual lens epithelial cells in the capsular bag after cataract surgery, to produce Elschnig's pearls or fibroblastic transformation causing capsular fibrosis.<sup>4</sup> It causes gradual deterioration of visual function by obstructing or by scattering the light rays resulting in decreased visual acuity, decreased contrast sensitivity, glare or even monocular diplopia.<sup>5,6</sup> It also decreases the field of view during therapeutic and diagnostic procedures.<sup>7</sup>

The current treatment of choice for PCO is Neodymium doped: Yttrium-Aluminum-Garnet (Nd: YAG) laser capsulotomy. It is relatively safe, gives instantaneous results and can easily be administered in an out-patient setting.<sup>8</sup> The Nd: YAG laser is solid type of laser, causes disruption of tissues by ionization mode of action. It has 1064nm wave length, with infrared radiation. It is a powerful continuous wave laser which is usually Q switched when used to treat the eye. The 1064nm wavelength is invisible and requires a He-Ne laser red aiming beam.<sup>9</sup>

A number of complications can occur after YAG laser capsulotomy such as elevation of intraocular pressure, rupture of anterior vitreous face, damage to intra ocular lens, hyphema, acute iritis, and cystoid macular edema (CMO).<sup>10,11</sup> Unusual complications include corneal endothelial damage,<sup>12</sup> macular hole,<sup>13</sup> vitreous hemorrhage,<sup>10</sup> retinal detachment,<sup>8</sup> macular hemorrhage,<sup>14</sup> and endophthalmitis.<sup>15</sup>

Nd: YAG Laser posterior capsulotomy is a frequently performed procedure in any ophthalmology department. The purpose of this study was to find out the complications of Nd: YAG laser capsulotomy in our set up.

## MATERIAL AND METHODS

It was a prospective study conducted over a period of 1 year (from May 2012 to May 2013) at Khyber Eye Foundation Peshawar. A total of 406 patients (437 eyes) were included in the study.

### Inclusion criteria

1. Patients who had decreased vision due to posterior capsular opacification
2. More than 6 months duration after cataract surgery with intraocular lens
3. Age > 15 years
4. Both genders

### Exclusion criteria

1. Uncooperative patients
2. Previous history of retinal detachment or vitreoretinal surgery
3. Glaucoma
4. Uveitis
5. Dislocated IOL

Written informed consent was taken from all the patients. Before performing YAG laser detailed history was taken and complete ocular examination was performed including assessment of visual acuity using Snellen's vision chart, slit lamp examination, tonometry with Goldmann applanation tonometer and fundus examination with 90 D/ 78 D lens. Topical anesthetic (0.5% proparacaine hydrochloride) drops were instilled in the conjunctival sac and Abraham's posterior capsulotomy lens was applied for proper focusing and stabilization of eyeball. A consultant ophthalmologist performed all Nd: YAG laser capsulotomies using single shot mode. The amount of energy and number of pulses were adjusted as required.

Post-laser topical diclofenac (4 times/ day for 1 week) was given to all patients. Follow up was done at 1 day, 1, 2 and 4 weeks. Detailed eye examination was performed at each visit including measurement of IOP, anterior chamber examination, status of IOL, vitreous and fundus examination. Topical beta blocker therapy was started in eyes with raised IOP.

## RESULTS

A total of 406 patients were included in the study including 189 male (46.55%) and 217 female (53.44%). Mean age of the patients was 56.7 years, with a range of 15-82 years. Age distribution of patients is shown in (Table 1). YAG laser capsulotomy was performed in 1 eye in 375 patients and in both eyes in 31 patients. The number of eyes included in the study was 437.

Mean energy used was 4.1 mJ/ pulse (Range: 1.5 to 8.0 mJ/ pulse). Number of shots varied from 6 to 19 with a mean of 10.7. One or more complications were noted after YAG laser capsulotomy in 82 eyes (Table 2). Intraocular lens pitting was the most common complication seen in 56 eyes (12.81%). Transient elevation of intraocular pressure was seen in 38 eyes (8.69%) and cystoid macular edema was seen in 17 eyes (3.89%). Serious complications such as retinal detachment (RD) and endophthalmitis were uncommon and were seen in 2 eyes (0.45%) and 1 eye (0.22%) respectively.

**Table 1:** Age distribution of patients

Age Years	No. of Patients n (%)
≤ 30	21 (5.17)
31 - 40	30 (7.38)
41 - 50	95 (23.39)
51 - 60	124 (30.54)
61 - 70	87 (21.42)
> 70	49 (12.06)

**Table 2:** Complications of YAG laser capsulotomy

Complications	No. of Patients n (%)
IOL pitting	56 (12.81)
Transient IOP elevation	38 (8.69)
Cystoid macular edema	17 (3.89)
Uveitis	05 (1.14)
Hyphema	03 (0.68)
Retinal detachment	02 (0.45)
Lens subluxation / dislocation	01 (0.22)
Endophthalmitis	01 (0.22)

## DISCUSSION

YAG laser capsulotomy is the treatment of choice for posterior capsular opacification. It is usually a safe procedure but it may sometime cause complications.<sup>08, 10-15</sup>

In our study, IOL pitting was the most common complication seen in 56 eyes (12.81%). In one study IOL damage was seen in 19.2% cases after YAG laser capsulotomy.<sup>08</sup> Khan MY et al found IOL pitting in 22.4% cases,<sup>16</sup> while in another study it was seen in 3.33% cases.<sup>17</sup> Although IOL pitting is one of the common complications of YAG laser capsulotomy, it is usually asymptomatic and doesn't adversely affect the visual functions. In our study, posterior YAG offset was used to reduce the risk of IOL damage during the procedure, however the relation of IOL pitting with the extent of posterior YAG offset was not determined.

The second most common complication of YAG laser capsulotomy in our study was transient IOP elevation, which was seen in 38 eyes (8.69%). The mean IOP elevation was 7.4 mm Hg above the baseline. The frequency of raised IOP after YAG laser capsulotomy is highly variable, ranging from 0.8%<sup>11</sup> to 82%<sup>16</sup> in different studies. However the IOP elevation is usually transient. In our study, the IOP was well controlled with topical beta blocker therapy (0.5% levobunolol twice daily) in all cases.

In our study, cystoid macular edema was seen in 17 eyes (3.89%). In eyes with clinical suspicion, optical coherence tomography (OCT) was performed to confirm the presence of CMO. In one study CMO was seen in 9.6%.<sup>08</sup> In another study CMO was seen in 8.0% cases,<sup>20</sup> while in another study it was seen in 0.2% cases.<sup>11</sup>

Anterior uveitis was seen in 05 eyes (1.14%) in our study. In one study anterior uveitis was noted in 46.2% cases after YAG laser.<sup>08</sup> In one study conducted by Muhammad L et al anterior uveitis was seen in 8.0% cases,<sup>18</sup> while in another study it was seen in 0.6% cases after YAG laser capsulotomy.<sup>11</sup> In our study anterior uveitis was very mild in all cases and responded well to topical steroid therapy.

Hypphema, retinal detachment, lens dislocation / subluxation, and endophthalmitis were less common complications seen in our study. These complications were uncommon in other studies as well.<sup>08,11,16-18</sup> Other complications of YAG laser such as corneal endothelial damage,<sup>12</sup> vitreous hemorrhage,<sup>10</sup> macular hole,<sup>13</sup> and macular hemorrhage,<sup>14</sup> were not seen in our study.

Most of these complications are associated with the use of high energy level and poor focusing, although individual susceptibility also plays an important role. Nevertheless, minimum energy level combined with minimum number of precisely focused shots for achieving the desired effect can reduce the risk of complications.<sup>11</sup>

## CONCLUSION

A number of complications can occur after Nd: YAG laser capsulotomy. The most common of these complications are intraocular lens pitting, transient intraocular pressure elevation and cystoid macular edema.

### Author's Affiliation

Dr. Bilal Khan  
Vitreoretina Trainee  
Lady Reading Hospital  
Peshawar

Dr. Mumtaz Alam  
Assistant Professor  
Ophthalmology Department  
Peshawar Medical College  
Peshawar

Dr. Mir Ali Shah  
Associate Professor  
Ophthalmology Department  
Lady Reading Hospital  
Peshawar

Dr. Bilal Bashir  
Vitreoretina Trainee  
Lady Reading Hospital  
Peshawar

Dr. Asif Iqbal  
Vitreoretina Trainee  
Hayatabad Medical Complex  
Peshawar

Dr. Adnan Alam  
Trainee Medical Officer  
Lady Reading Hospital  
Peshawar

## REFERENCES

1. Polack S, Kuper H, Wadud Z, Fletcher A, Foster A. Quality of life and visual impairment from cataract in Satkhira district, Bangladesh. *Br J Ophthalmol.* 2008; 92: 1026-30.

2. **Awasthi N, Guo S, Wagner BJ.** Posterior capsular opacification: a problem reduced but not yet eradicated. *Arch Ophthalmol* 2009; 127: 555-62.
3. **Erie JC, Hardwig PW, Hodge DO.** Effect of intraocular lens design on neodymium:YAG laser capsulotomy rates. *J Cataract Refract Surg.* 1998; 24: 1239-42.
4. **McDonnell PJ, Stark W, Green WR.** Posterior capsule opacification: A specular microscopic study. *Ophthalmology* 1984; 91: 853-6.
5. **Claesson M, Klaren L, Beckman C, Sjostrand J.** Glare and contrast sensitivity before and after Nd:YAG laser capsulotomy. *Acta Ophthalmol.* 1994; 72: 27-32.
6. **Sunderraj P, Villada JR, Joyce PW, Watson A.** Glare testing in pseudophakes with posterior capsule opacification. *Eye* 1992; 6: 411-3.
7. **Niazi MK, Hanif MK, Khan HA, Yaqub MA.** Neodymium: YAG; capsulotomy rates following implantation of PMMA and Arylic Intraocular lenses. *Professional Med J.* 2006; 13(4): 538-42.
8. **Burq MA, Taqui AM.** Frequency of Retinal Detachment and Other Complications after Neodymium: Yag Laser Capsulotomy. *J Pak Med Assoc* 2008; 58 (10): 550-2.
9. **Elkington AR, Frank HJ, Greaney MJ.** Lasers. In: *Clinical optics* 3<sup>rd</sup> Ed. 1999; 216-29.
10. **Shaikh A, Shaikh F, Adwani JM, Shaikh ZA.** Prevalence of different Nd: YAG Laser induced complication in patients with significant posterior capsule opacification and their correlation with time duration after standard cataract surgery. *Int J Med Med Sci.* 2010; 2: 12-7.
11. **Khanzada MA, Jatoti SM, Narsani AK, Dabir SA, Gul S.** Experience of Nd: YAG laser posterior capsulotomy in 500 cases. *J Liaquat Uni Med Health Sci.* 2007; 6: 109-15.
12. **Sherrard ES, Kerr Muir MG.** Damage to Corneal endothelium by Q switched Nd: YAG laser posterior capsulotomy. *Trans Ophthalmol Soc UK.* 1985; 104: 524-8.
13. **Wilkins M, Mcpherson R, Fergusson V.** Visual recovery under glare conditions following laser capsulotomy. *Eye* 1996; 10: 117-20.
14. **Majeed A, Bangash T, Muzaffar W, Durrani O.** Macular Hemorrhage: An Unusual Complication of Nd: YAG Laser Capsulotomy. *Pak J Ophthalmol.* 1998; 14: 118-20.
15. **Chambless WS.** Neodymium: YAG laser posterior capsulotomy results and complications. *J Am Intraocul Implant Soc.* 1985; 11: 31-2.
16. **Khan MY, Jan S, Khan MN, Khan S, Kundi N.** Visual Outcome after Nd-YAG Capsulotomy in Posterior Capsule Opacification. *Pak J Ophthalmol.* 2006; 22: 87-91.
17. **Javed EA, Sultan M, Ahmad Z.** Nd: YAG laser capsulotomy and complications. *Professional Med J* 2007; 14: 616-9.
18. **Muhammad L, Jabeen M, Wazir F, Qadir A, Salim M, Ahmad I.** Efficacy of Nd: YAG laser posterior capsulotomy in visual improvement of patients having posterior capsular opacification. *Gomal J Med Sci.* 2013; 11:97-100.