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*Results of Nd:YAG laser capsulotomy in posterior
capsule opacification*

Cataract is the most common ophthalmic problem. Nowadays there are two cataract surgical techniques. The first one is phacoemulsification based on grinding the lens nucleus by ultrasounds with its secondary aspiration and the second one is manual extracapsular cataract extraction (1). Posterior capsule opacification is considered a natural complication after cataract surgery responsible for high deterioration of visual acuity (3,7,11). Two major mechanisms may account for the process of opacification. Due to cataract extraction and removal of the anterior lens capsule the epithelial cells may remain on the periphery of the lens. They may migrate onto the posterior capsule and subsequently involve the deterioration of visual acuity described as Elchnig pearls. Pearling is especially common in young patients, 3-5 years following cataract operation. The second mechanism involves metaplasia of the epithelial cells into myofibroblasts which usually leads to fibrosis and contracture of the posterior capsule. In this case opacification results from secondary production of collagen and elaboration of the basement membrane (folds) (4, 12, 13). Besides, there are known mixed types of opacification: Elchnig pearls associated with fibrosis and pearling with folds of posterior capsule (3).

The condition of remaining posterior capsule transparent would be the introduction of such an operative technique which removed the anterior capsule completely with all epithelial cells.

Prevention of secondary posterior capsule opacification remains unknown, but the YAG laser capsulotomy is only one method of removal without opening an eye and therefore, there is less risk of staphylococcal endophthalmitis (6, 14).

High visual deterioration is the main indication for laser capsulotomy, but it is also performed when there is no sufficient insight into fundus of the eye to treat or diagnose and in monocular diplopia and dazzling results from folds of capsule (7).

Nd:YAG laser (neodymium-irium-aluminium-garnet) with modulative impulse have been used in Poland since 1976. Power applied to the tissues changes them into plasma (enlarging volume) and causing hydrodynamic shock wave mechanically tears tissues close to the stricken place. Large radiation power makes temperature grow to 10 000°C in this place, however, thermal effect is minimal due to a very short time of impulse duration (about 30 ns) and low thermal conductivity of the eye tissues (8, 9, 16, 17).

Another important cataract surgery complication is anterior capsule contraction syndrome based on an exaggerated reduction in the anterior capsulectomy opening and equatorial capsular bag diameter. Among known factors responsible for capsule shrinkage are: age over 60 years, fibrotic reaction produced by residual lens epithelial cells, and functional reaction of intraocular lens (IOL). Capsule contraction syndrome is observed in pseudoexfoliation, advanced age, in association with uveitis and myotonic muscular dystrophy. Early anterior YAG laser capsulotomy helps to resolve the contraction of the anterior capsulectomy opening which is a complication of capsular fibrosis and may reduce the incidence of intraocular lens dislocation and retinal detachment (5).

MATERIAL AND METHODS

In this study authors reviewed 28 eyes in 23 patients undergoing cataract operation: standard manual ECCE (extracapsular cataract extraction) and phacoemulsification with one type posterior chamber intraocular lens implantation. Twenty-one patients at the age from 60 to 85 years were after cortical, senile cataract and two persons of thirty following traumatic cataract. Cases with the epithelial pearling, capsular fibrosis and folds of posterior capsule were considered.

Laser capsulotomy consists in execution of the hole, about 3 mm in size in the posterior capsule, which assures immediate improvement of visual acuity first of all in central vision. The aim of this procedure is to obtain the hole equal to or bigger than a pupil in normal light. In all cases the Nd:YAG laser of Q-switch Zeiss type was applied. Each patient was pre-treated by 1% apraclonidine to prevent intraocular pressure elevation. During this procedure 10-25 shots of 0.8-2.0 mJ were employed to gain the effect. All patients were treated with 0.1% Dexamethasone every hour for the next two days.

RESULTS

Following ECCE and phacoemulsification the best visual acuity was obtained in 14 cases. A half of reviewed eyes required capsulotomy after one year, whereas 39% required it after 3 years. In three cases the time between cataract operation and

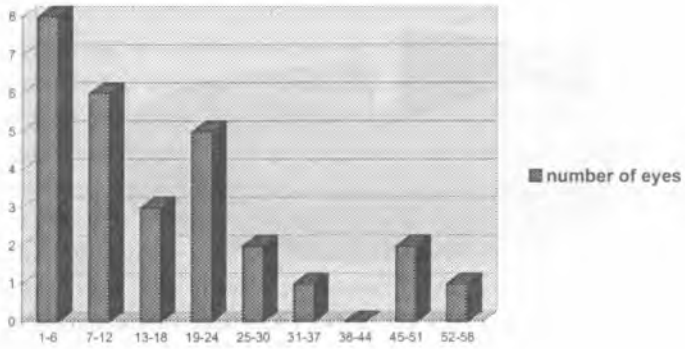


Fig. 1. Number of months between cataract operation and laser capsulotomy

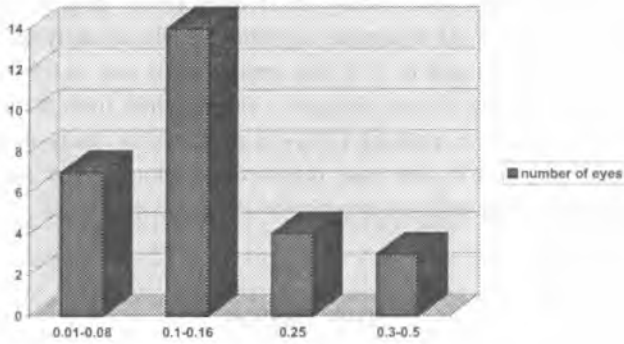


Fig. 2. Visual acuity before capsulotomy

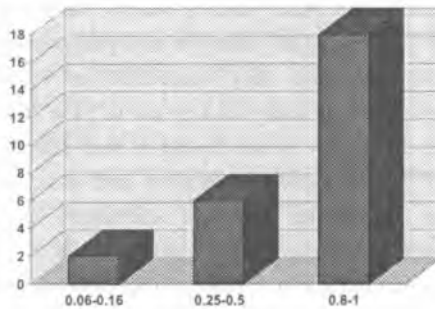


Fig. 3. Visual acuity following capsulotomy

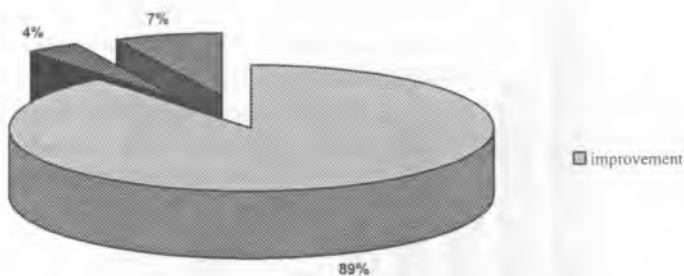


Fig. 4. Results of Nd:YAG laser capsulotomy

capsulotomy was longer than 3.5 years. Figure 2 shows the visual acuity before laser capsulotomy. Visus varies from 0.1 to 0.16 (5/50–5/30).

After removal of the opacified posterior capsule by Nd:YAG laser application we achieved the improvement of visual acuity in 25 cases (89%) (Fig. 4). Postoperative follow-up is shown in Figure 3. After capsulotomy the best visual acuity 0.8–1.0 (5/6–5/5) was obtained in 18 cases (64%) and in 21% the improvement was to 0.5–0.25. In two cases (4%) we did not notice any serious changes – vision varied from 0.1 to 0.16 and from 0.02 to 0.08. In the next two patients (7% – 3 eyes) visual acuity deteriorated due to concomitant glaucoma, and in one case repeated capsulotomy did not turn out to be successful resulting from diabetic neuropathy of the optic nerve.

DISCUSSION

Nd:YAG laser capsulotomy is one of the best methods of treatment of the opacified posterior lens capsule. In general, the improvement of visual acuity was achieved in 89% of eyes. The best visus 0.8–1.0 was obtained in 64% of cases, 0.5–0.25 in 21% of reviewed eyes. Our results are comparable to other studies, where the improvement of visual acuity was achieved in 65–100% and besides anterior and posterior diseases and functional disturbances present before operation they succeeded in 97–100%^{2,6}. Dębowska-Weiss described recovery of visual acuity to 0.9–1.0 in 91% (6).

Unfortunately, this kind of therapy is not devoid of side effects. Known complications result from destruction of barrier between vitreous and anterior chamber. The main among them include the intraocular pressure elevation, cystoid macula oedema, intraocular lens injury, retinal detachment, and iridocyclitis (6, 8, 9, 10). In our study we did not observe any serious complications following capsulotomy. However, in three cases we did not achieve any change in visual acuity due to other concomitant eye diseases: diabetic neuropathy of the optic nerve and glaucoma. Following laser capsulotomy about 50% of eyes had an intraocular elevation during first 2–4 hours. After other studies intraocular pressure was lower in eyes pre-treated with 1% apraclonidine. Rising pressure

is an effect of trabecularism blocked by the rest of anterior capsule. In the case of associated glaucoma intraocular pressure has been very high for several weeks or months following capsulotomy and it has usually decreased by laser iridectomy (8). The incidence of cystoid macula oedema is very low, estimated at 0.68% and it corresponds with the interval between cataract operation and capsulotomy. Aphakic eyes and postoperative vitreous prolaps tended to have a higher incidence of it than did pseudophakic eyes (8, 13, 16). Intraocular lens (IOL) may be damaged by laser rays concentrating not exactly on posterior capsule. IOL damage occurs rather often, according to other studies in 12%, 40%, and even 80% of cases. Due to the close contact between the IOL and the posterior capsule, Nd:YAG laser shots produce tiny visible marks; however, even when they seem to be prominent no visual symptoms, glare disability or lens intolerance are noticed (8, 13, 16). The retinal detachment is not found as often as laser complications due to its rather rare incidence. However, it occurs more frequently in high myopic eyes and if the interval between cataract operation and laser capsulotomy is shorter than six months. The uncommon incidence of the iridocyclitis (0.1%) described by Shah, corresponds with numbers of shots during capsulotomy procedure (8, 15, 16).

CONCLUSIONS

Nd:YAG laser capsulotomy: 1) is a safer and more effective method than surgical dissection, 2) less invasive (no risk of endophthalmitis), 3) brings immediate improvement of visual acuity, 4) does not require hospitalisation.

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SUMMARY

The most common postoperative complication of cataract extraction is posterior capsule opacification. It causes the deterioration of visual acuity, however, there is no effective method to prevent it. The posterior capsule opacification is treated by surgical or laser capsulotomy.

The authors analysed the results of Nd:YAG application in dissection of the opacified posterior capsule. Twenty-eight consecutive cases (23 patients) of extracapsular cataract extraction and phacoemulsification with implantation of posterior chamber intraocular lenses were reviewed. In all cases of capsulotomy the Nd:YAG laser of Q-switch Zeiss type was applied.

The improvement of visual acuity was achieved in 25 cases (89%). The best visual acuity (0.8-1.0) was obtained in 72% of eyes and in 22% the improvement was from 0.25 to 0.5. In two cases visual acuity after capsulotomy deteriorated because of concomitant glaucoma. In one case repeated capsulotomy did not turn out to be successful. It was

caused by diabetic neuropathy of the optic nerve. We did not observe any serious complications following Nd:YAG laser capsulotomy described by the others: the intraocular pressure elevation, cystoid macular edema, intraocular lens injury, retinal detachment, iridocyclitis.

Nd:YAG laser capsulotomy is one of the best methods of treatment of posterior capsule opacification. It appears to be effective, safe, non-invasive and it does not require patient hospitalisation.

Ocena leczenia zmętnienia tylnej torebki soczewki laserem Nd:YAG

Zmętnienie tylnej torebki jest jednym z najczęściej występujących powikłań po prawidłowo wykonanym zabiegu usunięcia zaćmy. Wynikiem zmętnienia jest znaczne pogorszenie się ostrości wzroku, jednakże obecnie nie ma żadnych metod zapobiegania wtórnemu zmętnieniu tylnej torebki. Kapsulotomia tylna jest jedną z najlepszych metod leczenia tego schorzenia. Przeprowadza się ją metodą chirurgiczną jak i przy użyciu lasera Nd:YAG.

Celem pracy była ocena wyników zastosowania lasera neodymowego w zmętnieniu tylnej torebki soczewki. Analizie poddano 28 oczu u 23 pacjentów po zewnątrztorebkowym usunięciu zaćmy oraz po fakoemulsyfikacji z wszczepionymi sztucznymi soczewkami tylnokomorowymi. Wszystkie zabiegi wykonano przy użyciu lasera neodymowego typu Q-Switch Zeiss.

Poprawę ostrości wzroku uzyskaliśmy w 25 przypadkach (89%). Ostrość wzroku rzędu 0,8-1,0 uzyskano w 72% oczu, a u 22% poprawiła się do 0,25-0,5. W dwóch przypadkach ostrość wzroku pogorszyła się z powodu współistniejącej jaskry. Natomiast u jednej pacjentki dwukrotna kapsulotomia nie przyniosła poprawy widzenia na skutek towarzyszącej neuropatii cukrzycowej n.II. W naszym materiale nie obserwowaliśmy powikłań opisywanych przez innych autorów: wzrostu ciśnienia wewnątrzgałkowego, torbielowatego obrzęku płamki, uszkodzenia sztucznej soczewki i zapalenia tęczęwki.

Kapsulotomia wykonana laserem Nd:YAG jest uważana obecnie za jedną z najlepszych metod leczenia zmętnienia tylnej torebki soczewki. Jest metodą skuteczną, bardziej bezpieczną i mniej inwazyjną w porównaniu z zabiegiem chirurgicznym oraz nie wymaga hospitalizacji chorych.