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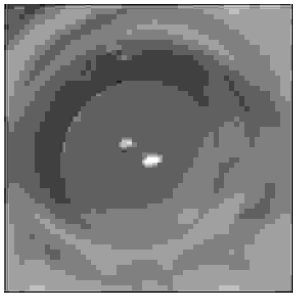


NEODYMIUM: YAG;
CAPSULOTOMY RATES FOLLOWING IMPLANTATION OF PMMA AND ACRYLIC INTRAOCULAR LENSES

DR. MUHAMMAD KHIZAR NIAZI
MBBS, FCPS (OPHTH)
PAF, Masroor-Karachi.

DR. MOHAMMAD KASHIF HANIF
MBBS, FCPS (OPHTH)

DR. HASEEB AHMED KHAN, MBBS

DR. Muhammad Amer Yaqub
MCPS, FCPS, FRCS(ED)

ABSTRACT... khizar_aleem@yahoo.com **Objective:** To evaluate the incidence of posterior capsule opacification after phacoemulsification, between acrylic and polymethylmethacrylate intraocular lenses, by comparing their YAG laser capsulotomy rates. **Design:** It was a randomized clinical trial. **Place and duration of study:** Department of Ophthalmology, Military Hospital Rawalpindi, between March 2002-04. **Patients and Methods:** One hundred and five patients were randomized to receive either a foldable acrylic lens (fifty-two cases), or rigid polymethylmethacrylate lens (fifty-three cases) following phacoemulsification for cataracts. Postoperatively their visual acuities were recorded along with the presence of posterior capsular opacification. Laser capsulotomy was performed if the eyes had lost 2 or more lines of visual acuity. Results: The visual acuity loss at six months in the PMMA group was greater than that in the acrylic group ($p < 0.001$,Chi-square test).65% cases exhibiting PCO in the Polymethylmethacrylate group developed it within the first six months, whereas in the acrylic group the development of posterior capsular opacification was seen eighteen months after surgery in 60% cases. Nd: YAG laser capsulotomy was performed in 28% of cases in the PMMA group compared to 6% in the AcrySof group ($p < 0.005$). **Conclusion:** Acrylic intraocular lenses is associated with less incidence of posterior capsular opacification and with a significantly reduced rate of YAG laser capsulotomy compared with Polymethylmethacrylate lenses.

Key words: Acrylic intraocular lens; Polymethylmethacrylate intraocular lens; Neodymium:YAG capsulotomy; Posterior capsule opacification; lens; cataract, Phacoemulsification.

INTRODUCTION

Posterior capsular opacification (PCO) is the commonest complication of cataract surgery with an incidence of between 10% and 50% by 2 years postoperatively[1]. Opacification of the posterior capsule results from migration and proliferation of residual lens epithelial cells (LECs), which remain in the capsular bag after cataract surgery, to produce Elschnig's pearls or fibroblastic transformation causing capsular fibrosis[2-4]. In the peripheral capsular bag these processes cause no symptoms, but when cells encroach onto the visual axis they cause light scatter and visual deterioration and the

need for Neodymium Yittrium Argon (Nd:YAG) laser capsulotomy.

PCO has important medical, social, and economic adverse effects and consequently there is considerable interest in its prevention. The presence of a posterior chamber intraocular lens (IOL) in the capsular bag has been known to reduce the risk of PCO development[5-6], probably by acting as a mechanical barrier against the migration of proliferating lens epithelial cells on the posterior capsule[5-7], and/or minimizing capsule wrinkling and limiting the space available for lentoid formation[8]. These effects are thought to be enhanced when an IOL has more contact with the posterior capsule[9]. Similarly, biconvex and plano-convex polymethyl methacrylate (PMMA) intraocular lenses (IOLs)[10-11], as well as silicone plate haptic IOLs[12]have been reported to have a beneficial effect on PCO. Recently, Acrylic IOLs have shown a lot of promise in preventing and delaying the occurrence of PCO and we planned our study to compare them with PMMA lenses as regards to posterior capsular opacification.

MATERIALS AND METHODS

The study was carried out during a span of two years (March 2002-2004). All patients who were admitted to the department of Ophthalmology, Military Hospital Rawalpindi for bilateral cataract surgery in this period were screened for inclusion in the study. Patients were excluded if they had any ocular pathology other than senile cataract, history of prior ocular surgery or inflammation, a pupillary diameter less than 6.0 mm after full dilatation, pseudoexfoliation syndrome, diabetics, and patients who could not be available for follow up. Postoperative exclusion criteria after randomization were any significant surgical complication, and asymmetrical or out-of-the-bag implantation.

A written informed consent was obtained from each patient and then these were randomly divided into group-A having foldable Acrylic IOL implant (AcrySof, MA30AC, Multipiece, 12.5 mm length, 5.5 mm biconvex rectangular edged optic, Alcon Surgical, Fort Worth, TX, USA), or group-B receiving rigid PMMA IOL (Alcon, LX10BD, Single-piece, 12.0 mm length, 5.25 mm biconvex rounded edges optic, Alcon Surgical, Fort Worth, TX, USA) implants.

A single surgeon (AY) performed all surgeries. Firstly, a 3.2 mm straight limbal incision was made followed by a continuous curvilinear capsulorhexis, measuring approximately 5.5 mm in diameter, was accomplished using a bent needle. After hydrodissection, endocapsular phacoemulsification of the nucleus and aspiration of the residual cortex were carried out. The corneal wound was then enlarged for IOL implantation. The capsule was inflated with 2% hydroxyproylmethylcellulose, after which the IOL was placed into the capsular bag using intraocular lens forceps. After capsular polishing, the viscoelastic material was washed and wound closed without stitches. All surgeries were uneventful and the IOLs were accurately placed in the capsular bag.

Follow-up was carried out in both groups at two weeks, one month, six months, one year, eighteen and twenty-two months. Visual acuity, detailed slit-lamp examination, and posterior capsular opacification (PCO) by retroillumination technique was assessed. At eighteen months of surgery, Nd: YAG capsulotomy was performed in eyes of both groups which had lost two or more Snellen`s lines of acuity from the initial postoperative acuity.

Statistical analysis was done by applying Chi-square test to compare differences between the immediate postoperative visual acuity, the visual acuity at six, twelve and eighteen months, the number of cases developing PCO, and number of eyes that required Nd: YAG laser posterior capsulotomy in both the groups. A difference with a p-value of less than 0.05 was considered to be statistically significant.

RESULTS

Mean postoperative follow-up was 17.8 months +/- 1.7 (SD) (range 16 to 22 months). By eighteen months after surgery, three patients were lost in follow-up, and by two years after surgery another four patients did not appear for follow up because of illness. Therefore, 98 patients (93.33%) completed the study. The mean (standard

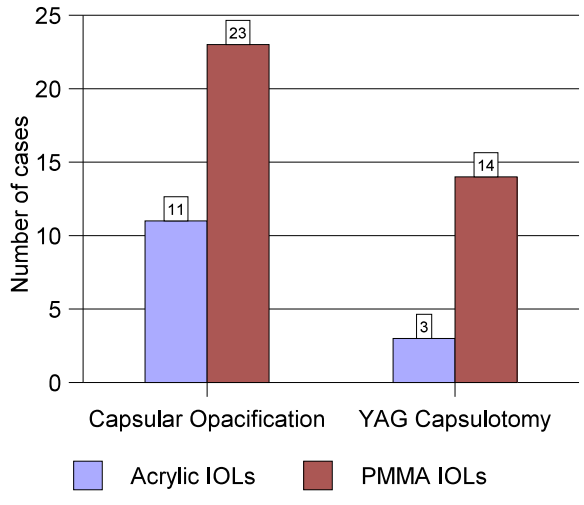
deviation) age in the Acrylic group was 61.3(SD 6.3) years compared to 62.2(SD 5.9) years in the Polymethylmethacrylate group, with an age range of 51-79 years. There were no statistically significant differences within the two IOL groups regarding sex distribution.

At one month after surgery, best corrected visual acuity between the two groups was comparable. However, thereafter, the visual acuity in the PMMA group worsened significantly at six and twelve months compared to the Acrylic group ($p<0.001$).

At six months of surgery, signs of posterior capsular opacification were seen in fifteen eyes (30%) of PMMA group and three (6%) cases of acrylic group. Subsequently, at 22 months after surgery, PCO was seen in twenty three cases (46 %) of PMMA lenses and eleven cases (22%) of acrylic group.

Fourteen cases (28%) in the PMMA group and three (6%) in the acrylic group required Nd:YAG capsulotomy at 22 months after surgery which was significantly lower ($p<0.005$) than that in the PMMA group (Figure-1).

Fig-1. Development of PCO and need for Nd: YAG laser capsulotomy in the two groups (n=100)



DISCUSSION

Experimental and clinical studies have shown that small capsulorhexis (diameter of up to 5.5 mm) and capsular bag implantation of IOL are likely to reduce the PCO incidence when compared with the 6.0 to 7.0 mm capsulorhexis[13]. The ideal diameter of the capsulorhexis has yet to be elucidated. Many surgeons believe that the LECs at the equator of the capsular bag are the most important in the pathogenesis of PCO and postulate that a capsulorhexis diameter larger than the IOL optic allows fusion of the anterior capsular flap to the posterior capsule setting up a mechanical barrier to LEC migration from the equator[14-16]. A sharp optic edge can prevent the invasion of lens epithelial cells into the retrolental space, which leads to less PCO[17-21]. Other factors that may have a beneficial role include a truncated IOL optic that helps in reduce the incidence of PCO[22], optimum IOL size[23], and Intraocular lens made from hydrophobic acrylic material[24].

Our study demonstrates that at one month after surgery, the visual acuity was almost the same between eyes with the PMMA IOLs and those with the acrylic IOLs. Thereafter, however, visual acuity in eyes with the PMMA IOL worsened significantly with time due to the greater degree of PCO as compared to eyes with acrylic IOLs. Specifically, PCO in the presence of a PMMA IOL increased from the early postoperative period, with fifteen (65%) of the total 23 cases exhibiting it within the first six months. This increase virtually reached a peak by 12 months after surgery. Whereas in the acrylic PCO started to develop 14-16 months after surgery, (at one year only three cases had developed PCO) and at 18 months it was seen in seven (60%) cases of the total eleven cases. and was visually significant only in a minor number of eyes. Studies carried out in the past have also reported that the frequency of eyes developing PCO was higher with the PMMA IOL25,26 than that with the acrylic IOL[27-30].

The Nd:YAG capsulotomy rate was also worse with the PMMA IOL than with the acrylic IOL; fourteen eyes (28%) in PMMA group required it by the end of study

period compared to three eyes (6%) in acrylic group. The percentage difference in the Nd:YAG capsulotomy rate between the two groups within two years after surgery was 22%, which is considered to be clinically significant. Oner and Ferliel[31] observed that 24.7 percent of their eyes with PMMA IOLs developed PCO significant enough for laser capsulotomy, whereas the same occurred in 8.7 percent of acrylic eyes, a difference of about 16 percent. Similarly, Kuchle and Lausen[32] observed that 35 percent of their eyes with PMMA IOLs developed PCO significant enough for laser capsulotomy, whereas the same occurred in 09 percent of acrylic eyes, a difference of about 26 percent. Apart from the composition, the design of the optical edge is also different between the two IOLs, and a sharp edge of Acrysof IOL seems to be advantageous in restricting the amount of PCO. Therefore, greater PCO with the PMMA IOL may be partly due to the round optic edge.

CONCLUSION

This study indicates that implantation of an acrylic intraocular lens helps reduce the incidence of posterior capsular opacification as well as the need for Nd:YAG capsulotomy. PMMA IOLs require Nd:YAG capsulotomy earlier in the postoperative period as compared to ACRYLIC IOLs.

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