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Frequency and distribution of various posterior capsular opacities post cataract extraction

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Abstract

• AIM: To evaluate the frequency and distribution of various types of post cataract surgery and intraocular lens (IOL) implantation posterior capsular opacity (PCO) in hospitals.

• METHODS: This cross sectional, observational and descriptive study included 200 patients, 123 male and 77 female aged between 43 and 77 (mean age 62.4) years, referring for cataract procedure from 2003 till 2007. The mean follow-up period of patients was 23 (range from 16 to 60) months. Data were gathered during follow-up time via a questionnaire and entered in a computer using SPSS software. Analysis was performed using ANOVA and Chi-Square tests.

• RESULTS: The various types of PCO included, fibrotic (63%), residual epithelial proliferative cells (15%) and mixed type (22%). The mean time period for development of postoperative decreased visual acuity due to PCO was 19.3 (range from 3 to 48) months, younger patients had a significantly better vision post cataract surgery ($P=0.0001$), but the incidence of PCO was also more in them. In the older age group, fibrotic PCO was significantly more, while mixed type of opacities were the least prevalent ($P=0.016$).

• CONCLUSION: The present study did not determine any specific risk factors for development of PCO, and the most common type was fibrosis, all of the cases experienced both qualitative and quantitative decrease in vision and some of them required treatment with YAG Laser capsulotomy which is relatively expensive and has its own complications.

• KEYWORDS: posterior capsular opacity; cataract extraction; intraocular lens implantation; YAG laser capsulotomy

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INTRODUCTION

Cataract is one of the four leading causes of blindness in the world and cataract surgery is the most commonly performed ophthalmologic operation, nowadays in the most of the cases cataract extraction is performed by the extracapsular and phacoemulsification method using ultrasound, while the method of removal of lens contents by a small incision and replacement by synthetic materials is relatively rare [1,2]. In both methods the posterior capsule is retained for replacement of the intraocular lens (IOL) and posterior capsular opacity post cataract operation is the most common complication and cause of decreased visual acuity and relative symptoms seen in 20%-30% up to 50% of cases after operation [1,2] mostly within 2-3 years (2 months to 5 years) after cataract surgery. Factors affecting posterior capsular opacity (PCO) include surgical technique, size of capsular rhexis, aphakia and psuedophakia, IOL within the bag and/or sulcus and material and design of lens such that polyacrylic as compared to PMMA and silicone, sharp edged and round edged lenses. This is therefore a multifactorial problem which is related to some extent to material and design of lens and surgical technique. After cataract surgery, residual epithelial cells and cortical fibers in the anterior capsule and or within the bag are capable of proliferation, fibrotic change, metaplasia and migration, some of these ultimately undergo changes to other types of cells and result in PCO. Changes in the lens equatorial region results in shaping of a fibrosis coarse structure around the capsular bag and formation of a specific type of opacity (Soemmering's ring), the cellular inflammation near the rhexis results in globular opacity (Elschnig's pearls) closure of the visual axis and at the rhexis edge mesenchymal cellular changes results in formation of fibroblasts and protein containing extracellular secretions which are not present in a normal lens, transfer of cells to the center of the acellular part of the lens results in PCO formation and light scatter and ultimately decreased visual acuity function that is named visually significant PCO at this stage. The morphology of posterior cellular opacities includes fibrosis and Elschnig's pearls named mixed type of opacity. Anyway, PCO resulted in decrease of vision both qualitatively and quantitatively and some cases require treatment usually with YAG laser capsulectomy which is relatively expensive and has its own complications such as IOL damage, increased intraocular pressure (IOP), cystoid macular edema (CME), retinal detachment (RD, from 1% after cataract extraction to 2% after YAG laser capsulotomy), IOL subluxation, corneal and iris damage, anterior chamber bleeding, iritis and worsening of localized infection if present [1-3]. The present study was designed to evaluate the frequency and distribution of various types of PCO after cataract surgery in hospitals attached to Yazd Medical Sciences University, Yazd, Iran.

Table 1 Visual acuity after cataract surgery related to age *n*(%)

Age(yr)	1/10-5/10	6/10	7/10	8/10	9/10-10/10	Total
43-59	2(3.8)	4(7.7)	5(9.6)	20(38.5)	21(40.4)	52(100)
60-64	2(3.7)	19(35.2)	16(29.6)	10(18.57)	7(13.0)	54(100)
65-69	6(9.1)	38(57.6)	15(22.7)	6(9.1)	1(1.5)	66(100)
70-77	16(57.1)	11(39.3)	0(0)	1(3.6)	0(0)	28(100)
Total	26(13.0)	72(36.0)	36(18.0)	37(18.5)	29(14.5)	200(100)

$P = 0.001$

Table 2 Visual acuity in patients with posterior capsular opacities after cataract surgery according to age groups *n*(%)

Age(yr)	1/10-2/10	3/10-5/10	6/10	7/10	Total
43-59	4(8.2)	12(24.5)	23(46.9)	10(20.4)	49(100)
60-64	4(8.0)	21(42.0)	19(38.0)	6(12.0)	50(100)
65-69	15(23.1)	28(43.1)	15(23.1)	7(10.8)	65(100)
70-77	14(50.0)	8(28.6)	1(3.6)	5(17.9)	28(100)
Total	37(19.3)	69(35.9)	58(30.2)	28(14.6)	192(100)

$P = 0.001$

MATERIALS AND METHODS

This was a cross sectional observational analytic study, during preoperative clinical examination cataract was classified as mature and immature in four grades. Population under study included 200 patients (123 male and 77 female), those underwent cataract extraction and referred for decrease of vision due to PCO from the year 2003 till 2007, the age range was between 43 and 77(mean 62.4) years, and mean follow-up time period was 23 (range from 16 to 60) months. Cases were selected by consecutive method from patients referring for cataract procedure who had PCO postoperatively. The special questionnaire included variables like age, sex, type of PCO, visual acuity before and after operation and at the time of start of opacity or referral of patient and time period of start of opacity after procedure. It is mentionable approximately between 20%-50% (average 30%) of operated cataract cases who undergone surgery developed PCO in this follow-up time.

Statistical Analysis Data was entered in a computer using SPSS software. Analysis was performed using ANOVA and Chi-Square tests. $P < 0.05$ was considered significant.

RESULTS

Of the total, one hundred and twenty-three were male (61.5%) and 77 were female (38.5%). The mean age was 62.4 years. In addition, eleven cases had capsular wrinkling and or folding which aren't true opacities but actually inflamed membranes related to iritis and therefore excluded from the study. Patients were divided into four age groups: 43-59, 60-64, 65-69 and 70-77 years. Results were also analyzed according to this grouping. The maximum number of patients was in the 65-69 years age group (66 patients) and least number of patients was in the 70-77 years age group (28 patients). The visual acuity of 121 patients prior to operation was counting finger (CF) level to 1/10 of Snellen's chart and that in 79 patients was hand motion (HM) perception and light perception (LP) levels. Patients with mature cataract had fewer PCO, as compared to patients with immature cataract. The mean time period for decreased vision after cataract extraction was 19.2 ± 9.9 months in male and 19.6 ± 11.8 months in female. Younger patients had significantly betterment of vision as compared to older patients post-operatively, which is shown in Table 1. Considering the fact that the rate of decrease in vision increases with age, according to the statistical tests, this relation was significant, which is shown in Table 2. Increase in age also had a significant effect on the type of PCO, such that older patients had higher rate of fibrotic opacities and least rate of mixed types of opacities. An important point in the present study was that patients with mature cataract had significantly lower number of posterior capsular opacities as compared to patients with immature cataracts (Table 3).

Table 3 Posterior capsular opacities types in population under study with age classification *n*(%)

Age(yr)	Fibrosis	Elschnig's Pearls	Mixed	Total
43-59	28(53.8)	8(15.4)	16(30.8)	52(100)
60-64	32(59.3)	6(11.1)	16(29.6)	54(100)
65-69	42(63.6)	15(22.7)	9(13.6)	66(100)
70-77	24(85.7)	1(3.6)	3(10.7)	28(100)
Total	126(63.0)	30(15.0)	44(22.0)	200(100)

$P = 0.016$

DISCUSSION

In assessment of visual acuity post cataract extraction and IOL implantation, the patients were divided into four age groups. Most of the patients attained an approximate visual acuity of 6/10 and a very few had visual acuity between 1/10 and 5/10. The difference in visual acuity of the various groups was statistically significant, such that the visual acuity of patients in the younger age group was more than that of the older patients ($P = 0.0001$) result is similar to the study by Stephen D Mc Leod [4] in San Francisco, America in the year 2005. The mean visual acuity of the patients during referral due to PCO was between 1/10 and 5/10 which was much less than that after the operation, in a similar study by Meacock *et al*[5] at St. Thomas Hospital of London, England, in the year 2003, there was a significant difference in physiological visual indices after operation and during PCO formation that is somewhat similar to the present study. In another study by

Safi *et al*[6] at Rasool Akram Hospital of Tehran, Iran, in the year 2000, there was a relation between age and rate of visual acuity during referrals due to PCO, which is similar to the present study. In the study by Auffarth *et al*[7] in the year 2005, it was reported that sharp edged optical design intraocular lenses of various materials led to a significant decrease in secondary cataract or PCO, which was not discussed in the present study. In another study by Auffarth *et al*[8] in four European countries: France, Italy, Germany and Spain in the year 2004 on the various types of lenses including PMMA, Silicon and Acrylic both hydrophilic and hydrophobic, 2 years after surgery, the percentage of patients requiring YAG Laser capsulectomy was as follows: hydrophobic 7. 1%, silicon 16. 2%, PMMA 19. 3% and hydrophilic acrylic 31. 1%. In the present study, though various types of lenses were used, their relation with the need for YAG laser capsulectomy was not studied. In the study by Wejde *et al*[9] in the year 2003, in Sweden, three types of lenses of different materials were studied and 20% of PMMA, 22% of silicon and 8% of acrylic lens patients required YAG Laser capsulotomy. Neumayert *et al*[10] in Vienna in the year 2005 on the morphological changes of the capsular opacities after extracapsular over three years concluded that fibrosed opacities were relatively more than pearls in which is similar to the present study. In addition, it was reported that opacity changes included cheese holes, islands, plates, trace of PCO, automatic regression and regrowth, overlapping growth of tow layers, with passage of time, which was not studied in the present study. Zhu[11] in Shanghai, China, in the year 1990, reported that opacities increased with increase in time and younger patients had initial better vision, but with passage of time, the visual acuity decreased due to extra opacities which somewhat is similar to the present study. In the study by Zematiene[12] in Lithuania in the year 2003, fibrosis and pearls were reported as two major types of opacities, while in the present study that was similar if a certain percentage were mixed type opacities. In the study by Sundelin *et al*[13] in Sweden in 1999, 43% of the patients had PCO 5 years after cataract surgery, while in the present study 20%-50% (mean 39. 5%) had PCO which had started 20 months after procedure up to 5 years. In the study by Mootha *et al*[14] in New Mexico, America, in the year 2004, opacity formation started 6 weeks after operation, while in the present study, opacities were reported 8 weeks after operation.

CONCLUSION

According to the results of the present study, approximately 20%-50% of PCO (average 30%) were reported after extracapsular and phacoemulsification cataract surgery, fibrosis being the most prevalent followed by proliferation and then mixed type, we did not found any specific risk factors related to PCO type and incidences, opacities were more in younger patients in compare with adult, but there was no direct relationship with age, there was no major difference between extracapsular and phacoemulsification cataract extraction as well as type, design and material of the IOL, those cases have had mature cataract shown less than immature ones PCO formation, the rates of PCO increased with lapsing time.

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白内障摘除术后不同后囊膜混浊的发生率和分布

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摘要

目的: 评价院内白内障手术和人工晶状体(IOL)植入术后不同类型 PCO 的频率和分布。

方法: 本横断、观察和描述性研究包括 200 名 2003/2007 年间提交白内障手术的患者。男 123 名,女 77 名,年龄 43~77(平均 62.4)岁之间。患者平均随访期为 23(16~60)mo。随访期间通过一份问卷收集数据并使用 SPSS 软件输入计算机。使用方差分析和卡方检验分析。

结果: 不同类型的后囊膜混浊,包括纤维化(63%),残留上皮细胞增殖(15%)和混合型(22%)。由 PCO 引起的视力减退发生的平均时间为 19.3(3~48)mo。年轻患者白内障手术后视力明显提高($P=0.0001$),但 PCO 的发生率也多些。在老年组,纤维化后囊膜混浊明显多见,而混合型混浊是最不普遍的($P=0.016$)。

结论: 目前的研究并没有测定 PCO 发生的任何特定的危险因素,最常见的类型是纤维化。所有的病例都经历定性和定量的视力减退,其中一些需要 YAG 激光晶状体囊膜切开术治疗,比较昂贵并有其自身的并发症。

关键词: 后囊膜混浊;白内障摘除术;人工晶状体植入术;YAG 激光晶状体囊膜切开术