RESEARCH ARTICLE

To assess the role of cataract extraction in glaucoma management by its intraocular pressure lowering effect

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Abstract

Objective: To measure the mean change of intraocular pressure in glaucoma patients with cataract after uncomplicated phacoemulsification surgery with intraocular lens implanted in capsular bag.

Methods: The quasi-experimental study was conducted at the Ophthalmology Department of Pakistan Institute of Medical Sciences Shaheed Zulfiqar Ali Bhutto Medical University, Islamabad, Pakistan, from June 11 to December 10, 2018, and comprised patients who had uncomplicated cataract extraction by phacoemulsification with intraocular lens implant in the capsular bag in glaucomatous eyes of age 30-80 years. Visual acuity, intraocular pressure, slit lamp examination, fundoscopy, visual fields, details about topical medication and relevant history were recorded not more than 5 days before cataract extraction. Intraocular pressure was recorded using Goldman's applanation tonometer one day before surgery, and post-surgery 1 month and 3 months. Data was analysed using SPSS 20.

Results: Of the 40 patients, 19(47.50%) were males and 21(52.50%) were females. The overall mean age was 52.23±9.44 years. Mean pre-operation intraocular pressure was 20.42±1.69mmHg, while at 1 month post-surgery it was 18.55±0.90mmHg and at 3 months it was 17.03±1.19mmHg (p=0.0001).

Conclusion: There was a significant change in intraocular pressure readings in glaucoma patients with cataract after uncomplicated phacoemulsification surgery with intraocular lens implanted in capsular bag.

Keywords: Glaucoma, Phacoemulsification, Intraocular pressure. (JPMA 71: 1100; 2021)

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Introduction

Glaucoma is a progressive irreversible damage to the retinal nerve fibre layer and optic nerve head, while cataract is the opacification of clear crystalline lens resulting in compromised visual acuity (VA).[1] Overall, 36 million people are blind and cataract is the main cause (35%), while glaucoma is responsible for 8% of global blindness.[2] In Pakistan, cataract, being the number one cause, accounts for 51.50% of the total blindness, and glaucoma is the fourth common cause accounting for 7.10% of vision-loss.[3] Primary open angle glaucoma is the commonest, and the most common cause of glaucomatous vision-loss is late presentation in Pakistan.[4,5] It has been observed that about one-third of the patients undergoing cataract surgery have glaucoma.[6]

Glaucomatous damage to the optic nerve head and retinal nerve fibre layer is a complex process, and its management is only through lowering the intraocular pressure (IOP). Means of lowering IOP include prostaglandin analogue which lowers IOP by increasing uveoscleral outflow; beta blockers that reduce aqueous production by acting on beta receptors of ciliary epithelium and constriction of arterioles supplying ciliary body; carbonic anhydrase inhibitors and sympathomimetics both reduce aqueous production; parasympathomimetic; laser iridotomy; trabeculoplasty; and trabeculectomy which increases aqueous outflow to lower IOP.[7]

Cataract extraction also lowers IOP and helps in glaucoma management by changing anterior chamber structural parameters by increasing anterior chamber depth and widening the angle, thereby increasing aqueous flow and reducing the IOP to a variable extent.[8] Compared to trabeculectomy and other laser glaucoma surgeries having high risk of serious complications associated with them, cataract extraction is safer, faster, economical and has lower risk of serious complications. There is a clear evidence of early clear lens extraction in patients of angle closure glaucoma being superior as first-line treatment to topical and laser treatments.[9]

The visual-loss in cataract is reversible and with the advent of the phacoemulsification surgery with IOL

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implantation, the quality of vision has greatly improved, whereas in glaucoma, the visual-loss is irreversible. Most patients may not lose vision completely, but the quality of life is adversely affected due to progressive decrease of the field of vision and lowering of IOP is the mainstay of management to halt disease progression.[1]

Most studies have been done on one or two groups comprising angle closure glaucoma, open angle glaucoma or ocular hypertension alone in patients with cataract and most have uncontrolled preoperative high IOP.[10] The current study was planned to assess the mean change in IOP in diagnosed glaucoma patients after uncomplicated phacoemulsification surgery for cataract with intraocular lens (IOL) implant in the capsular bag.

Patients and Methods

The quasi-experimental study was conducted at the Ophthalmology Department of Pakistan Institute of Medical Sciences (PIMS), Shaheed Zulfiqar Ali Bhutto Medical University, Islamabad, Pakistan, from June 11 to December 10, 2018. After approval from the institutional ethics review committee, the sample size was calculated using OpenEpi version 3[11] while taking population mean pre- and post-op IOP as 18.2±1.3mmHg and 16.3±1.5mmhg respectively, level of significance 5% and power of test 95%.8 The sample was raised using non-probability consecutive sampling technique from among the outpatient department (OPD). Those included were male and female patients aged 30-80 years having cataract causing Snellen VA of 6/12 or less and glaucoma with maximum IOP 45mmHg who underwent uncomplicated phacoemulcification (Alcon Infinity Vision System) surgery with IOL implanted in the capsular bag. Those excluded were patients who had any surgery or laser procedure for IOP control, any corneal pathology or refractive procedure, history of ocular trauma, uveitis, retinal pathologies or any other ocular comorbidity, and axial length <21mm or >26mm

Basic data was collected using a proforma. VA (Snell chart), IOP (tonometre by Inami), slit lamp (Topcon SL-3D) examination, fundoscopy (Volk 90D), visual fields (Zeiss Humphrey Field Analyser), and relevant history were recorded not more than 5 days before cataract extraction. IOP was recorded first individually, then average of all by Goldman's applanation tonometer one day pre-surgery, and 1 month and 3 months post-surgery.

Data was analysed using SPSS 20. Quantitative variables were expressed as mean ± standard deviation (SD), and qualitative variable as frequencies and percentages. Data normality was checked by Skewness and Kurtosis tests against values cited in literature.[12] Paired sample t. test was applied to compare the pre- and post-op IOP values. P<0.05 was taken as significant. .

Results

Of the 40 patients, 19(47.50%) were males and 21(52.50%) were females. The overall mean age was 52.23±9.44 years, with 28(70%) patients aged 30-55 years (Table-1). Mean pre-op IOP was 20.42±1.69mmHg, while at 1 month post-surgery it was 18.55±0.90mmHg (Table-2) and at 3 months it was 17.03±1.19mmHg (p=0.0001) (Table-3).

Table-1: Distribution of patients according to age (n=40).

Age (in years)	No. of Patients	%age
30-55	28	70.0
56-80	12	30.0
Total	40	100.0

Mean ± SD = 52.23 ± 9.44 years.

Table-2: Mean change of intraocular pressure (IOP) after one month.

	IOP		P-value
	Mean	SD	
Pre-operative	20.42	1.69	0.0001
After 1 month	18.55	0.90	

SD: Standard deviation.

Table-3: Mean change of intraocular pressure (IOP) after three months.

	IOP		P-value
	Mean	SD	
Pre-operative	20.42	1.69	0.0001
After 3 months	17.03	1.19	

SD: Standard deviation.

Discussion

The current study observed significant IOP reduction after uncomplicated phacoemulcification of cataract in glaucoma patients. The exact mechanism by which cataract surgery improves IOP is unclear. Many hypotheses have been presented in the literature, like hyposecretion of aqueous humour secondary to ciliary body irritation in which phacoemulcification produces free radicals that may act as inflammatory mediators causing breakdown of the blood-aqueous barrier; and increased outflow of aqueous humour in which phacoemulcification increases endogenous prostaglandins secretion rate that could increase uveoscleral outflow and consequently lower IOP, and ultrasound stimulates the production of interleukins 1α

by trabecular meshwork, increasing outflow facility and it may also be that the irrigation during phacoemulsification flushes the trabeculum, thereby decreasing outflow resistance;[13] and, finally, improvement of aqueous outflow facility by widening effect of lens extraction on the angle of anterior chamber. Cekic et al. reported that the size of the capsulorhexis had an effect on IOP after phacoemulsification, showing that a capsulorhexis of 4mm had a greater IOP lowering effect than a capsulorhexis of 6mm.[14] In our series, a capsulorhexis of 5mm was performed in all patients, but the effect of the size of the capsulorhexis on IOP could not be clearly demonstrated. In eyes with narrow angles, phacoemulcification increases the anterior chamber depth and can permanently normalise IOP. In eyes with primary angle closure, cataract surgery attenuates the anterior positioning of the ciliary processes, leading to significant widening of the angle. Corneal phacoemulsification has been recommended as an appropriate surgical procedure in compliant glaucoma patients on 1 or 2 medications preoperatively with otherwise stable visual fields and optic nerve morphology.[13,14] Studies on patients with open-angle glaucoma have demonstrated a pressure-lowering effect of phacoemulcification.[15-17]

In the current study, different types of glaucoma were not specified and an overall mean change in IOP was determined after cataract extraction, which was significant.

In terms of limitations, patients were not stratified according to the type of glaucoma as all types were included except angle closure. The type of cataract was also not used for stratification as patients had different types of cataract except intumescent and mature. Also, just overall mean IOP change was determined because of limited time and resources. IOP was observed only for 3 months post-surgery. These factors might have affected the results, but despite these limitations, the study has shown that phacoemulcification can be considered in glaucomatous eyes with cataract for IOP control before doing any other surgery to control the IOP.

Conclusion

There was significant IOP change in glaucoma patients with cataract after uncomplicated phacoemulsification surgery with IOL implanted in capsular bag.

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