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Visual outcome of cataract surgery with pupillary sphincterotomy in eyes with coexisting corneal opacity

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Abstract

Background: To evaluate the visual outcome following cataract surgery with pupillary sphincterotomy in eyes with coexisting corneal opacity.

Methods: Patients with leucomatous corneal opacity with significant cataract were enrolled for the study. The uncorrected visual acuity and best-corrected visual acuity (BCVA) were recorded and the anterior segment was thoroughly evaluated by a slit lamp biomicroscope before the surgery. Only those patients who had some amount of clear peripheral cornea were selected. Posterior segment pathology was ruled out by indirect ophthalmoscopy after pupillary dilatation, if possible, or by B-scan ultrasonography. Conventional extracapsular cataract extraction with pupillary sphincterotomy was performed and an intraocular lens was implanted. Postoperatively, the eyes were evaluated on day 1, and 1 week and 6 weeks following surgery for similar parameters.

Results: Fourteen eyes of 14 patients were included in the study, of which 13 (92.85%) patients were male. The mean age of the patients was 47.85 ± 7.37 years. All the eyes had a dense central leucomatous corneal opacity. Twelve (85.71%) eyes had two or more quadrants of deep vascularisation. Sphincterotomy was performed mostly (71.42%) in the nasal or inferonasal quadrant. The intraocular lens was implanted in 13 (92.85%) eyes, and one (7.1%) eye was left aphakic due to the occurrence of a large posterior capsular tear. Preoperatively, all eyes had BCVA $< 6/60$. At 6 weeks after surgery, all eyes had BCVA $\geq 6/60$ and four (28.57%) eyes had BCVA $\geq 6/18$. The mean BCVA preoperatively in these eyes was 0.015 ± 0.009 , which changed to 0.249 ± 0.102 at 6 weeks following surgery.

Conclusions: Extracapsular cataract extraction and intraocular lens implantation with pupillary sphincterotomy provides ambulatory and useful vision to patients of cataract with coexisting central leucomatous corneal opacity.

Background

Corneal opacity is an important cause of blindness, especially in third world countries. Around 3% of the blind-

ness in India is secondary to corneal opacity [1]. A cataract is often associated with corneal opacity and contributes to the poor visual acuity. Although corneal transplantation

with cataract extraction and intraocular lens implantation is the preferred method for treating corneal scars with a cataract, the scarcity of donor material and the risk of graft failure, particularly in high-risk keratoplasty, create the need for other methods for improving vision. We evaluated the visual outcome of cataract extraction with pupillary sphincterotomy in eyes with central corneal opacity with a significant cataract.

Methods

A prospective clinical trial was conducted at the Rajendra Prasad Centre for Ophthalmic Sciences, All India Institute of Medical Sciences, New Delhi, in which patients with leucomatous corneal opacity with a significant cataract were enrolled for the study. All the patients selected for the study had a central corneal opacity and at least one quadrant of clear peripheral cornea. A detailed patient history was taken and preoperative evaluation of the eye was performed. This evaluation included uncorrected visual acuity, best corrected visual acuity (BCVA), best visual acuity after dilatation and, using a stenopic slit, slit lamp biomicroscopy of the anterior segment to look for the size and depth of the corneal opacity, the quadrant of clear cornea and the amount of cataract after dilatation of pupil.

An evaluation of intraocular pressure was performed by digital tonometry. Posterior segment pathology was ruled out by indirect ophthalmoscopy after pupillary dilatation, if possible, or by B-scan ultrasonography. Eyes with inaccurate projection of rays, a badly disfigured anterior segment and those with posterior segment pathology were excluded from the study. Cataract surgery was performed by a conventional extracapsular extraction technique and a 6.5 mm optic, single-piece intraocular lens of polymethylmethacrylate was implanted. Pupillary sphincterotomy was performed in the area under the clear cornea. Prior to surgery the patients were informed of the prognosis and the advantages and disadvantages of the surgery over a corneal triple procedure (penetrating keratoplasty in combination with extracapsular cataract extraction and intraocular lens implantation).

Surgical technique

Surgery was performed under local anesthesia by peribulbar injection of 6 cm³ of 2% xylocaine with 2 cm³ of 0.5% bupivacaine. A conjunctival flap was made with the conjunctival scissors and mild cautery was performed near the limbus. A limbal groove was created from the 10 o'clock to the 2 o'clock positions and the anterior chamber was entered with the bard parker blade. Under air, 0.1 ml of 0.1% Trypan blue (Vision blue; DORC International BV, ZUIDLAND, Netherlands) was injected to stain the anterior capsule and was washed out after 15 s. The anterior chamber was formed with 2% hydroxypropyl methyl cel-

lulose and anterior capsulotomy was performed with a bent 26 G needle by the beer can opener technique. A full thickness cut was made along the entire length of the groove. Nucleus delivery was performed by double expression with pressure on the sclera at 12 o'clock with irrigating vectis and the lens hook at 6 o'clock. Residual cortical matter was removed by closed chamber aspiration with a simcoe irrigation aspiration cannula. A posterior chamber intraocular lens was implanted when nearly 90% of the visible lens matter was removed. The intraocular implant was dialed to dislodge the remaining lens matter, which was then engaged in the aspiration port of the simcoe cannula and aspirated out. The intraocular lens implanted was a single piece lens of polymethylmethacrylate with 6.5 mm optic size and an overall size of 13 mm. Pupillary sphincterotomy was performed in the region of clear cornea or as decided by the stenopic slit before surgery. Sphincterotomy was performed by angled vannas scissors after lifting the pupillary edge by injecting viscoelastic under it. An anterior chamber wash was performed with the balanced salt solution to remove the residual viscoelastic and air was injected into the anterior chamber. Five interrupted corneoscleral sutures were placed to close the wound and air was replaced with balanced salt solution. Subconjunctival injection containing 0.4 ml gentamicin, 0.4 ml dexamethasone and 0.2 ml of 2% xylocaine was given, and the eye was closed with a pad and bandage.

The patient was postoperatively prescribed 0.3% ciprofloxacin eye drops four times a day, 0.1% dexamethasone phosphate eye drops four times a day, 1% tropicamide eye drops three times a day and 0.5% timolol eye drops twice a day if required. The eye was evaluated on day 1, and 1 week and 6 weeks following surgery for the parameters of uncorrected visual acuity, BCVA, anterior segment evaluation by slit lamp biomicroscope and fundus evaluation.

Results

Fourteen eyes of 14 patients were included in the study, of which 13 (92.85%) patients were male. The mean age of the patients undergoing surgery was 47.85 ± 7.37 years. All the eyes had a dense central leucomatous corneal opacity. Twelve (85.71%) eyes had two or more quadrants of deep vascularisation. The corneal opacity was a result of healed corneal ulcer in 12 (85.71%) eyes, and two (14.28%) eyes had scarring due to an alkali burn. The fellow eye was atrophic/phthisical in eight (57.14%) patients, having healed keratitis in two (14.28%) patients and alkali burn in two (14.28%) patients, and was within normal limits in two (14.28%) patients.

Sphincterotomy was performed mostly (71.42%) in the nasal or inferonasal quadrant. An intraocular lens was implanted in 13 (92.85%) eyes, and one (7.1%) eye was left aphakic due to the occurrence of a large posterior

Table 1: Outcome of cataract extraction with intraocular lens implantation in eyes with corneal opacity

Serial number	Age (years)	Sex	Etiology	Preoperative Visual Acuity	Fellow eye	Complication	Postoperative Visual Acuity	Quadrant of sphincterotomy
1	43	Male	Healed keratitis	0.01	Atrophic bulbi	—	0.25	Nasal
2	45	Male	Healed keratitis	0.01	Atrophic bulbi	—	0.25	Temporal
3	56	Male	Healed keratitis	0.01	Healed keratitis	—	0.25	Nasal
4	48	Female	Healed keratitis	0.01	Phthisis bulbi	—	0.33	Temporal
5	38	Male	Healed keratitis	0.03	Atrophic bulbi	—	0.33	Inferonasal
6	39	Male	Post alkali burn	0.01	Post alkali burn	—	0.16	Superotemporal
7	37	Male	Healed keratitis	0.01	Phthisis bulbi	—	0.16	Nasal
8	49	Male	Post alkali burn	0.03	Post alkali burn	Posterior capsular tear	0.1	Inferonasal
9	52	Male	Healed keratitis	0.01	Atrophic bulbi	—	0.16	Superotemporal
10	57	Male	Healed keratitis	0.01	Within Normal Limit	—	0.33	Inferonasal
11	55	Male	Healed keratitis	0.03	Healed keratitis	—	0.25	Nasal
12	60	Male	Healed keratitis	0.01	Phthisis bulbi	—	0.16	Nasal
13	47	Male	Healed keratitis	0.03	Within Normal Limit	—	0.5	Inferonasal
14	44	Male	Healed keratitis	0.01	Atrophic bulbi	—	0.25	Nasal

capsular tear at the time of surgery. All eyes had BCVA < 6/60 before the surgery. At 6 weeks after surgery, all eyes had BCVA \geq 6/60 and four (28.57%) eyes had BCVA \geq 6/18. The mean BCVA preoperatively in these eyes was 0.015 ± 0.009 . Postoperatively at 6 weeks, the mean BCVA in these eyes was 0.249 ± 0.102 (Table 1).

Discussion

Penetrating keratoplasty is the ideal treatment in eyes with corneal opacity. But in eyes with severe deep corneal vascularisation, the risk of graft rejection and subsequent failure is very high. Again, the paucity of good quality donor tissue in the presence of very high demand, particularly in this part of the world, further compounds the problems associated with keratoplasty [2].

A central corneal opacity can be managed by alternative methods. Rigid gas-permeable contact lenses have been tried successfully in nebular or macular corneal opacities with good visual outcome [3-6]. The aim of using rigid gas-permeable contact lenses for such opacities is to replace the irregular scarred corneal surface with the optically regular surface of the contact lens. However, a contact lens may not be successful in improving visual outcome in leucomatous corneal opacities.

An optical sector iridectomy has been performed successfully with reasonably good visual results in eyes with congenital or acquired central corneal opacity [2,7-11]. In eyes with a coexisting cataract along with corneal opacity, cataract extraction with an intraocular lens implantation is essential for visual improvement. The intraoperative use of Trypan blue dye enhances the visibility of the capsule during surgery [12,13]. An optical iridectomy, if per-

formed in these eyes, can give rise to problems related to the edge effect of the intraocular lens. Furthermore, there is a chance of refraction from both the phakic peripheral portion and the aphakic peripheral portion. In order to avoid this problem, we planned to perform pupillary sphincterotomy along with cataract extraction and intraocular lens implantation. This procedure increases the size of the pupil in the direction of the clear cornea but prevents any chance of an edge effect or both phakic and aphakic refraction.

In the present study, eight (57.14%) patients were one-eyed, with the other eye being atrophic, and four (28.57%) patients had merely ambulatory visual acuity due to corneal opacity. The increase in visual acuity by performing this procedure lasts a long time and is very satisfying to the patients, especially those who are one-eyed. The visual gain with this surgery may not be very good but it enables them to perform their day-to-day routine activities without being dependent on others. A corneal triple procedure may be ideal but if the graft fails they might lose even the ambulatory vision and become dependent on family members. A re-graft in such cases carries a worse prognosis. Moreover, in developing countries like India, poor socioeconomic status and ignorance stands in the way of regular follow-up following surgery and thereby hinders early identification of complications like rejection or infection. A poor ocular surface and suture-related problems that may be neglected due to ignorance and irregular follow-up are major risk factors associated with corneal graft infection [14]. Poor personal hygiene is another factor increasing the risk of graft infection and subsequent failure.

In our study, 12 (85.71%) eyes had two or more quadrants of deep vascularisation. Hence, these eyes were at great risk for development of graft rejection following a corneal triple procedure. So in these eyes a less demanding procedure like sphincterotomy with cataract surgery may be more helpful for the patient. Although the peripheral part of the human optical system does not form as sharp an image as the central part, the pupillary sphincterotomy aids in the addition of peripheral bundle of rays so that a relatively clear image is produced by the peripheral rays superimposed on the blurred image of the central rays [8,9]. Thus, one does not attain a visual acuity of 6/6, which is not the aim of this surgery, but a significant improvement of vision does occur. For attainment of good visual acuity by this surgery, the peripheral cornea should be clear. In our cases, the peripheral cornea was clear except in two eyes with chemical burn, in which there was slight haze in the periphery as well. However, these patients also attained reasonably good vision by which they could carry out their routine activities. The commonest site for sphincterotomy was nasal or inferonasal as it is good for both distance and near vision and because the area is not covered by the lid. In four eyes, however, sphincterotomy was performed temporally as the corneal opacity was more towards the nasal side and the temporal cornea was clear.

Conclusions

The present study serves to demonstrate that cataract extraction with pupillary sphincterotomy is a useful procedure if performed in eyes with central corneal opacity with a significant cataract. Sphincterotomy is safe and enhances the visual performance of the eye, and it is especially relevant in developing countries where the facilities for corneal transplantation and subsequent follow-up are suboptimal. In bilaterally blind persons or in eyes with severe deep corneal stromal vascularisation, sphincterotomy may be considered as a safe alternative to corneal triple procedure. Although a corneal triple procedure may provide an excellent visual result, it may not last a lifetime, particularly in these high-risk cases. Cataract surgery combined with pupillary sphincterotomy in the area of the clear cornea may confer a long-lasting ambulatory vision in cataract patients with central corneal opacity.

Competing interests

None declared.

Authors' contributions

RS designed the study and performed the data collection and analysis. NS wrote the manuscript and RBV performed the case selection and surgeries. All authors read and approved the final manuscript.

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