ORIGINAL RESEARCH

A Prospective Study to Assess Intraocular Pressure Following Full Thickness Penetrating Keratoplasty at Tertiary Health Care Centre

[1]Dr.Sakshi Tiwari, [2]Dr.Preeti Rawat

[1]PG resident 3rd year, [2]Professor, Department of Ophthalmology, M.Y.H Indore, Madhya Pradesh, India

Corresponding Author
Dr.Sakshi Tiwari
PG resident 3rd year, Department of Ophthalmology, M.Y.H Indore, Madhya Pradesh, India
Email: drsakshitiwari2412@gmail.com

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ABSTRACT
Introduction: Penetrating Keratoplasty has been one of the most effective and successful organ transplants for over a decade. Glaucoma following penetrating Keratoplasty (PK) is one of the most common cause for irreversible visual loss and the second leading cause for graft failure after rejection. **Aims and Objectives:** To study the number of patients developing Glaucoma following penetrating Keratoplasty & to manage those developing the disease. **Material and Methods:** This is a prospective study which was conducted on 67 eyes of 66 patients with various corneal lesions attending Ophthalmic OPD of Upgraded department of MYH Indore during period from 1st Nov 2021 to 30th Oct 2022. **Results:** Of the 67 eyes in the present study M:F ratio was 53:14. Post op IOP was above 21mmHg in 17 cases (25.37%) while it was within normal limits i.e. < 21mmHg in 50 cases (74.62%). With increase in graft size incidence of rise in IOP increases i.e. 88.2% in cases of 8mm graft size, 11.8% in cases in 7.5mm graft size and 5.9% in cases of 7 mm graft size.Visual acuity of the cases of post PK rise in IOP preoperatively was mainly Hand movements in 12 cases (70.6%) and Perception of Light in 5 cases(29.4%). **Conclusion:** Raised IOP following keratoplasty is a common entity and needs to be followed up closely.
Keywords: Glaucoma, Post Penetrating keratoplasty, Raised intraocular pressure

INTRODUCTION

Penetrating keratoplasty has been one of the most effective and successful organ transplants for over a decade. Glaucoma following penetrating keratoplasty (PK) is one of the most common cause for irreversible visual loss and the second leading cause for graft failure after rejection. Post-PK glaucoma is a significant clinical problem because of its frequency of occurrence, difficulty in diagnosis and montoring, and complexity of management. In the previous studies the incidence of Post Penetrating Keratoplasty Glaucoma varies from 9-31% in the early postoperative period and from 18-35% in the late postoperative period. [1,,2,3,4,5,6] Post-PK glaucoma is defined as an elevated IOP greater than 21 mmHg, with or without associated visual field loss or optic nerve head changes.

AIMS AND OBJECTIVES

Present study was conducted to study the number of patients developing Glaucoma following Penetrating Keratoplasty.

MATERIAL AND METHODS

This is a prospective study which was conducted on 67 eyes of 66 patients with various corneal lesions attending Ophthalmic OPD of Upgraded department of MYH Indore during the period 1st Nov 2021 to 31st Oct2022.

METHODOLOGY

After a detailed history, thorough ocular examination and relevant investigations of patients were done and they were posted for surgery. The Patients were adequately administered preoperative medication and the procedure was carried out. All the patients complaints were analyzed and thorough preoperative assessment including recording of personal data, complete ophthalmic evaluation including gonioscopy and indirect ophthalmoscopy was carried out. Keratoplasty was done in cases of corneal pathology of varied aetiology like infectious keratitis (non healing corneal ulcers, corneal abscesses, perforated corneal ulcers, and descemetocoele), corneal scars (adherent leucomas, maculoleucomatous opacities,

scars due to trauma or keratitis of varied aetiology), bullous keratopathy, regrafts and staphyloma.

Cornea for transplantation was obtained from cadaveric donor eyes. Grafts of various sizes ranging from 6mm to more than 9 mm was used in this study. Keratoplasty done was either alone or combined with other procedures like lens extraction with anterior vitrectomy, triple procedure, cataract surgery done secondarily or regrafting. The effect of all these additional interventions on post operative rise in IOP was also analysed.

They were followed-up weekly for first month, biweekly for the next two months, and monthly for the next one year. Patients developing any complications were followed up more frequently.

RESULTS

Out of the 67 cases, 53 cases (79.1%) were males and 14 (20.9%) were females. Of the total 67 cases The maximum cases were 34 (50.7%)Which were in the age range of 41-60 yrs followed by 12 cases (17.9%) in 21-40 years age group, 11 cases (16.4%) in 61-80 yrs and 7 (13.2%) cases below 20 yrs of age group. The Minimum no. of cases i.e. (4.5%) were above 81 yrs of age. (Table 1)

Table No. 1- Showing Age and Sex Distribution of patients

Age in years	Males		Females		Total	
	No.	%	No.	%	No.	%
0-20 years	7	13.2	0	0	7	13.2
21-40 years	8	15.1	4	28.6	12	17.9
41-60 years	27	50.9	7	50.0	34	50.7
61-80 years	9	16.9	2	14.2	11	16.4
>81 years	2	3.8	1	7.1	3	4.5
Total	53	79.1	14	20.9	67	100

Out of the total 67 cases of the study the main indication for Penetraing Keratoplasty was infectious keratitis in 35 cases (52.3%), corneal scars in 22 cases (32.8%), regrafts in 5 cases (7.5%) bullous keratopathy in 4 cases (5.9%), And staphyloma only one case (2.9%). Thus the maximum cases in which Penetrating Keratoplasty was done were of infectious keratitis i.e. 52.3% who were not responding to full medical treatment and were either threatening to perforation or perforated ulcers. (Table 2)

Table No. 2- Showing Etiology for Penetrating Keratoplasty

Pathology	No. of eyes	% of cases
Infectious keratitis	35	52.3%
Corneal scar	22	32.8%
Regraft	5	7.5%
Staphyloma	1	2.9%
Bullous keratopathy	4	5.9%
Total	67	100%

Out of 67 eyes IOP was above 21mmHg in 17 cases (25.37%) while it was normal in 50 cases (74.62%). The IOP was read after 2 weeks in all the cases except in some cases where there was indications of raised IOP it was read even earlier. (Table 3)

Table No. 3 – Showing the status of Post Operative Intra Ocular Pressure

No. of eyes	IOP<21mmHg		IOP > 21mmHg	
	No. of eyes	%	No. of eyes	%
67	50	74.62%	17	25.37%

Out of the 67 cases incidence of Raised IOP in post-operative period was seen in 17patients (25.37%). Out of the 35 cases of infectious keratitis 7 cases (20%) had rise in IOP, 6 cases (27.3%) out of 22 cases of corneal scars, 2 cases (40%) out of 5 cases of regraft and 2 cases (50%) out of 2 cases of bullous keratopathy had IOP more then 21 mmHg. Thus as far aetiological correlation is concerned the maximum cases of increased IOP i.e. 50% (2 out of 4 cases) of bullous keratopathy and 40% (2 cases out of 5) of regrafts.

Of the 67 cases in the present study 41 cases (61.1%) of cases underwent only PK and in the rest cases i.e. 26 cases (38.8%) additional surgery had been done. Of these 26 cases, PK with cataract surgery with anterior viterctomy was done in 12 cases, triple procedure in 6 cases, PK with cataract was done in 2 cases and regrafting in 6 cases. Of the 41 cases where only PK was done had rise in IOP in 5 cases. And of the 26 cases where additional procedure was done rise in IOP was seen in 12 (46.15%) cases. (Table 4)

Table No.4- Showing IOP Rise With Additional Surgical Procedures

Group	Case type	Total cases		%	No. with raised IOP	%
PK only	Not Applicable	41		61.1%	5	12.2%
Additional procedures	PK+ Cataract extraction + ant. Vitrectomy	12	26	46.15%	5	41.6%
	Triple Procedure	6			3	50%
	PK+ secondary cataract surgery	2			2	100%
	Regrafting	6			2	33.33%
Total		67			17	

In this study graft use for transplantation was taken to be 0.5mm larger than recipient bed. Of all the case there were 3 cases were with graft size of more than 9 mm. On tabulating the graft size of the 67 cases in the present study it was observed that the Maximum no. Of cases in this study i.e. 49 cases had graft size as 8mm, 7.5mm in 7 cases, 8.5mm in 5 cases, >9mm in 3 cases, 7 mm in 2 cases and of 6 mm in 1 case. It was observed that of the 17 cases of rise in IOP max, cases was in with graft of 8mm size, 2 cases with 7.5 mm and 1 case with 7mm graft. Thus it was observed that with increase in the graft size the incidence of rise in IOP increases. The Cases with graft sizes of 6mm, 8.5mm and 9 mm or more did not show any rise in IOP. (Table 5)

Table No.5 - Size of Graft and Raised IOP

Graft size	No. Of eyes	No. Of eyes	% eyes
6mm	1	-	-
7mm	2	1	5.9%
7.5mm	7	2	11.8%
8mm	49	14	82.3%
8.5mm	5	-	-
>9mm	3	-	-
Total	67	17	100%

The Management of raise IOP was medical in all the cases where rise in IOP was observed. The IOP was successfully controlled medically in 5 (29.4%) patients and in the rest 14(70.6%) cases surgical management in the form of trabeculectomy was done. Thus the majority of cases required surgical management. IOP was controlled by either medical or surgical management in all the 17 cases in the present study. Repeat trabeculectomy was done in 1(5.9%) with MMC after 1 Month of doing the 1st trabeculectomy. In another case MMC was used primarily during trabeculectomy. Mean IOP 2wks after surgical management – 16.6mmHg (12.2-20.6mmHg). (Table 6)

Table No.6- Showing Treatment Modality of Raised IOP cases

Modality treatment of eye	No. of eyes	% eyes
Medical	5	29.4%
Surgical	12	70.6%
Total	17	100%

DISCUSSION

Among the 67 eyes in the present study M:F ratio was 53:14, Both males 53 cases (79.1%) and females 14 cases (20.9%) were mainly in the age group of 41-60 yrs. Youngest being 5 yrs and oldest being 9 yrs of age. Age range was 5-90 years (mean 47.85 years). Maximum patients (49.3%) were in the age group of 41-60 years as seen in the Table No. 1, Ethan M. Kutzcher et al in 2004 in their study reported that the mean patient age was 43 years (range, 4-86 years); 23 (66%) were men, and 12 (34%) were women. [7]

In the study done be Mansour al Muhaimeed et al (2002) on 715 cases of PK he reported the male as 451 cases (63.1%) and females as 264 cases (36.9%), Age range was 1-91 yrs and ean was 40.6 yrs.[8]

As compared to Kutzscher's and Mansours study males were proportionately more in our study whereas females were less. But the age range and mean age of the study sample were similar to their study. This presentation of more males can be attributed to greatere awareness for visual rehabilitation among males. The most common age group of presentation was 41-60 yr which indicates to the working population.

On comparing our results with that of Dada et al (2008), [9] it was evident that elevation was found in 50% of the regraft cases which in nearly similar to our result. But Mansour et al (2002) had less cases of raises IOP in this categoiy of regraft i.e. only 26.9%. [8]

In the study by Dada et al (2008) it was reported that raised IOP was found in 9.2% cases of with scars, which in similar to that seen the study by Mansour et al (2002) as 13.6%. These values were much less than

that reported in the present study , as cases with raised IOP was seen in 27.3% of scare.[9]

When cases of infectious keratitis were compared it was found that 50% of cases of infectious keratitis had rise in IOP which was higher to the finding in the present study. But in the study by Mansour et al (2002) there was rise in IOP in 31.7% of the infectious keratitis cases which is similar to in the present study.

It was also conferred from the table that in the study by Dada et al (2008) rise in IOP was seen in 20-70% of bullous keratopathy cases and in 20.25% of cases of bullous keratopathy cases in study by Mansour et al (2002). These values were similar to that reported in the present study.[8,9]

In the present study maximum cases with post op rise in IOP was seen with regrafts and bullous keratopathy eases i.e. 40% und 50% respectively.

In the present study it was observed that of the 67 cases the maximum no. of PK were done in eyes with infectious keratitis 52.3% (35 eases) and corneal scars 32.8% (22 cases).

The aetiological correlation to post op rise in IOP showed, that the maximum number of cases of increased IOP in cases operated for bullous keratopathy and regrafts i.e. 40% and 50 % of the cases.

It was found that in the present study the majority of the cases of raised IOP were above 40 yrs of age i.e. 88.2% (15 cases of 17 with post PK rise in IOP).

With the performance of addition surgeries either concomitantly or later the chance of rise in IOP increases i.e. 46.15%.With increase in graft size incidence of rise in IOP increases i.e. 88.2% in cases of 8mm graft size, 11.8% in cases in 7.5mm graft size and 5.9% in cases of 7 mm graft size.

Post operatively higher incidence of rated IOP is seen in cases with PAS and steroid induced rise of IOP i.e. 35.35 and 47.05% respectively.Post operatively aphakics and psuedophakics have a higher percentage of cases of post PK rise in IOP i.e. 35 % and 26.7% as compared to phakics (18.8%).

Among the various post operative risk factors the average value of level of raised IOP in various post op cases was maximum in viscoelastic induced rise in IOP i.e. 45.5 mmHg.

On considering the phakic status of the eyes in post operative period phakics had the maximum recorded average level of IOP-44.9mmHg as compared to aphakics (31.0mmHg) and psuedophakics (35.3mmHg).Majority of the cases had rise in IOP in the late post op period; 88.2% (15 cases out of 17 cases.)

Of all the cases op post PK rise in IOP majority of the cases; 70.6% required surgical management as trabeculectomy for the control of IOP. Whereas 29.4% required medical for the IOP to be controlled.

Graft clarity in the cases with post PK rise in IOP was clear in 6 cases (26.3%) and hazy in the rest i.e. 64.7% (11 out of the 17 cases.)

Visual acuity of the cases of post PK rise in IOP preoperatively was mainly HM in 12 cases (70.6%) of cases and PL in 5 (29.4%). But in the post operative period after the control of IOP either medically or surgically by trabeculectomy the visual acuity was CF in majority of the cases 8 cases (47.0%), 6 cases (35.3%) had HM visual acuity and 2 cases (11.8%) had visual acuity of PL, whereas 1 case had visual acuity of 6/24.Rise in IOP was associated with a significant reduction in the percentage of eyes achieving good visual acuity.

CONCLUSION

In conclusion, the present study provides insight into the incidence of post PK rise in IOP, the various preoperative risk factors (infectious keratitis, corneal scars, regrafts and bullous keratopathy), additional surgeries, graft size, post operative risk factors (PAS, steroid use, vitreous in AC, viscoelastics in AC, aphakia and psuedophakia), as well the impact of this serious complication on graft survival and visual outcome. Post PK rise in IOP is a serious complication of PKP that is significantly associated with an increased risk of graft failure and poor visual outcome.

SOURCE OF FUNDING

Nil

CONFLICT OF INTEREST

Nil

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