

ORIGINAL RESEARCH

Complications And Their Causative Factors In Patients Undergoing Penetrating Keratoplasty

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ABSTRACT

Introduction- Penetrating keratoplasty can visually rehabilitate many of those who suffer from blindness or visual impairment due to corneal diseases. The aim of the study was to know the complications and their causative factors in patients undergoing penetrating keratoplasty.

Materials and methods-Thirty patients were selected for corneal replacement from Department of Ophthalmology, Guru Gobind Singh Medical College & Hospital, Faridkot for penetrating keratoplasty. Procurement of Cornea for graft placement was carried out from the Eye Bank, which were enucleated within 6 hours of death of deceased and preserved under suitable desired conditions. Data obtained was analyzed using SPSS Version-16 data analysis software. Unpaired t test was used to statistically assess the data of preoperative observations and postoperative complications.

Results- Early clouding of graft was noted in 1 (3.33%) case on 1st post-operative day in a male patient who had preoperative vascularisation and anterior synechiae. Seven cases (23.33%) had allograft reaction. One case (3.33%) had developed phthisis bulbi. 16 cases (53.33%) had epithelial abnormalities. 7 cases (23.3%) developed postoperative glaucoma. Out of these, 5 cases (71%) had preoperative raised tension. Vascularisation was present in 6 cases (86%) and anterior synechiae were present in 5 cases (71%).

Conclusion- Age and sex of the patients do not have any effect on the final visual outcome. Patients with re-graft are more prone to graft rejection. Presence of preoperative vascularised corneas is more prone to graft rejection. Other preoperative conditions which are associated with increased post keratoplasty complications were presence of anterior synechiae and adherent leucoma

Key words: Keratoplasty, cornea, blindness

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INTRODUCTION

Blindness due to ocular trauma and corneal ulceration are significant causes of corneal blindness which may be responsible for 1.5 – 2.0 million new cases of monocular blindness in the world every year.¹ Penetrating keratoplasty can visually rehabilitate many of those who suffer from blindness or visual impairment due to corneal diseases. Penetrating keratoplasty refers to the full thickness replacement of diseased corneal tissue with healthy donor cornea. Corneal grafting technique was started in early 20th century by Reisinger, Von Hippel, and Elsching.² Now penetrating keratoplasty is the most common and successful human transplantation procedure.

There are two types of keratoplasty, penetrating keratoplasty refers to the full thickness replacement of diseased corneal tissue with a healthy donor cornea and lamellar keratoplasty is a procedure in which partial thickness graft of donor tissue is used to provide tectonic stability and/or optical improvement. Complications associated with keratoplasty are wound leak, increased intraocular pressure, endophthalmitis, persistent epithelial defect, primary graft failure, graft rejection, recurrence of disease, for example in cases of corneal dystrophies.³ The purpose of this study was to analyze the visual outcome in post penetrating keratoplasty with follow up for 6 months in selected patients for the study.

MATERIALS AND METHODS

Total 30 patients with unilateral corneal pathology were selected randomly from the Department of Ophthalmology, Guru Gobind Singh Medical College & Hospital, Faridkot for the study. The study was carried out for the period of one and half year and the study group comprised of only 30 cases due to lack of willingness of patients for graft replacement surgery as well as limited corneal donation. Ethical clearance was taken from institution ethical committee for the commencement of the study. Procurement of Cornea for graft placement was carried out from the Bharat Vikas Parishad Eye Bank, Dept. of Ophthalmology, G.G.S Medical College Faridkot, which was enucleated within 6 hours of death of deceased after proper consent from the relatives and preserved under suitable desired conditions. Proper record of the donor comprising of age, sex, cause of death, time of enucleation since death, condition of cornea at the time of enucleation were maintained by the eye bank and grafts procured from the individuals with death of unknown cause, CNS diseases, such as Creutzfeldt-jakob disease, subacute sclerosing panencephalitis, rubella, Reye's syndrome, rabies, infectious encephalitis, infections such as HIV, hepatitis, septicaemia, syphilis and endocarditis, eye diseases such as retinoblastoma, malignant tumor of anterior segment and active ocular inflammation, prior ocular surgery (although pseudophakic eyes may

be used), congenital or acquired anterior segment abnormalities such as keratoconus and Fuchs' endothelial dystrophy were excluded from the study.

Preoperatively fluoroquinolone eyedrops and i.v. mannitol 350 ml was given to the patient for reduction of the intraocular pressure on the same day. Surgery was performed under facial and peribulbar (combined) local anaesthesia. Eye was rendered hypotonic by digital massage for 6-7 minutes. Eye globe was exposed by lid speculum. Then with the help of centred trephines, full thickness of diseased recipient cornea was replaced with 0.5 mm more size of full thickness of donor corneal graft. Suturing was done with 10-0 monofilament suture. 16 interrupted sutures were applied in all cases. If cataract was present, extracapsular cataract extraction was done as per condition. If vitreous was present in front of iris then it was removed with cellulose sponges and vannas scissors. Anterior vitrectomy was performed whenever required. Intraocular lens was inserted wherever needed.

STATISTICAL ANALYSIS

Data obtained was analyzed using SPSS Version-16 data analysis software. Unpaired t test was used to statistically assess the data. Correlation was carried out between preoperative observations and post-operative complications.

RESULTS

The demographic data of the study reveals that most of the patients were in 41-70 years of age group. Out of 30 cases 26 (86.67%) were male and 4(13.33%) were females. The history of the patients show that out of 30 cases, 9 cases (30%) had traumatic corneal opacities, 8 (26.67%) had healed infective keratitis, 1(3.33%) had aphakic bullous keratopathy, 1 (3.33%) had pseudophakic bullous keratopathy, 6 (20%) cases were of graft failure, 2 (6.67%) had keratoconus, 3 (10%) were of corneal dystrophies/degenerations (table 1). Table 2 shows preoperative observations. Postoperatively, early clouding of graft (table 3) was noted in 1 (3.33%) case on 1st post-operative day in a male patient who had preoperative vascularisation and anterior synechiae. The size of the graft used was 8.0mm

and there was no improvement in final visual outcome. Infection occurred in 2 cases (table 3), which were first diagnosed at 6-8 weeks of follow up. Both patients had preoperative vascularisation. One case was of bacterial keratitis and other was of fungal keratitis. Patients were put on antibacterial and antifungal drugs. But there was no improvement in final visual outcome. Seven cases (23.33%) had allograft reaction (table 4). Out of this 6 cases (85.7%) had pre-operative anterior synechiae and 4 cases (57.1%) had pre-operative vascularisation. Out of these, 3 cases (50%) were of re-grafting. Postoperatively, all 7 cases had vascularisation. Final improvement in vision was seen in 1 case (14.28%). p value was significant with p value < 0.001. One case (3.33%) developed phthisis bulbi (table 5) post-operatively. This patient had shallow anterior chamber and raised tension in early postoperative period and later on developed hypotony and phthisis bulbi. Visual prognosis was nil. P value was significant with p value <0.005. 7 cases (23.3%) developed postoperative

glaucoma (table 6). Out of these, 5 cases (71%) had preoperative raised tension. Vascularisation was present in 6 cases (86%) and anterior synechiae was present in 5 cases (71%). Out of 7 cases that developed raised tension, 1 case (14.3%) had shallow anterior chamber, 1 case (14.3%) had aqueous misdirection syndrome and in the remaining 5 cases, cause remained unknown. Final vision was improved in 3 (49%) cases. P value was significant with p value < 0.001. 16 cases (53.33%) had epithelial abnormalities (table 7). Out of which 9 cases (56%) had preoperative vascularisation and 8 cases (50%) had preoperative anterior synechiae. Postoperatively, out of 16 cases, 4 cases (25%) had associated raised intraocular tension and 12 cases (75%) had vascularisation. Final visual improvement was observed in 9 cases (56%) and remaining 7 cases (44%) underwent allograft rejection, resulting in leucomatous corneal opacities. P value was significant with p value < 0.001.

Diagnosis	Total number of cases	%
Traumatic corneal opacity	9	30
Infective keratitis	8	26.67
1. Bacterial	2	6.67
2. Fungal	-	-
3. Viral	6	20
Aphakic Bullous keratopathy	1	3.33
Pseudophakic Bullous keratopathy	1	3.33
Graft Failure	6	20
Keratoconus	2	6.67
Corneal dystrophies/degenerations	3	10

Table-1: Diagnosis of corneal pathology

DISCUSSION

Corneal blindness is the third most common cause of irreversible blindness in India and accounts for 0.9% of all causes of irreversible blindness.⁴ Visual prognosis in penetrating keratoplasty depends upon complications encountered by the patients. Infection was present in 2 (6.67%) cases in our study. One case was having bacterial keratitis (figure 1) and other was having fungal keratitis with associated history of trivial ocular trauma. Both cases presents after 4-

6 weeks of follow up. In both cases visual prognosis was bad. Wagoner MD et al⁵ found that out of 2103 of penetrating keratoplasty, 102 (4.9%) cases developed culture-positive keratitis during the study period, which was associated with a high incidence of graft failure and poor visual outcome. In another study, Hood CT et al⁶ found that of 487 cases of penetrating keratoplasty performed in 412 patients, 22 eyes of the 22 eyes of 22 patients (5.33%) developed

Condition of the eye		No. of cases	%age
Anterior synechiae	Not present	14	46.67
	Present	16	53.33
Vascularisation	Normal	15	50
	Present	15	50
Condition of the lens	Aphakic	7	23.33
	Cataract	11	36.67
	Pseudophakia	1	3.33
	Normal	11	36.67
Intraocular tension	Normal	20	66.67
	Raised	9	30
	Low	1	3.33
Vision	PL+ PR+	6	20
	Hand movements	14	46.67
	Finger counting at 1 m	10	33.33
Condition of the eye	Phthisical	1	3.33
	Absolute	1	3.33
	Enucleated	-	-
	Similar pathology	5	16.67
	Normal	23	76.67

Table-2: Preoperative observations

Type of complication	No. of cases	Preoperative			Postoperative			
		Ant synechiae	Vascularisation	Cataract	Day of clouding	Vascularisation	Final Vision	P-value
Early clouding of the graft	1	P	P	Aphakia	1 st P.O. day	P	Not improved	.001
infections	2	P1 NP-1	P-2	Normal	60 P.O. Day	P-2 NP-0	Not improved	0.001

Table 3: Post operative complications

postoperative corneal infections. Infection rate in above mentioned studies corresponds to our study and it has been found that suture related infections were common cause of corneal infections in patients of keratoplasty.

Clouding of cornea appeared in 3rd-4th postoperative week. Incidence of allograft reaction increases in cases of pre-existing

vascularisation, stromal keratitis and regrafting. In present study 7 cases (23.33%) developed allograft reaction. Out of 7 cases, 6 cases (85.7%) had pre-existing anterior synechiae, 4 cases (57.1%) had pre-existing vascularisation and 3 cases (50%) are of regrafting. Postoperatively all 7 (100%) cases developed vascularisation.

No. of cases	Sex	Preoperative			Avg Size of Graft	Postoperative			P-value
		Anterior synechia	Vascularisation	Lens		Average day of clouding	Vascularisation	Final vision	
7	M-7 F-0	6	4	3	7.12 Mm	22 nd P.O. Day	7	Improved-1 Not improved-6	.0054
Total-7	6	4	3				7	1	

Table 4: Allograft reaction

No. of cases	%	Preoperative		Size of Graft	Postoperative				P-value
		Vascularisation	Anterior Synechia		Shallow A.C.	Early period tension	Late period tension	Visual prognosis	
1	3.33	-	1 (100%)	8.5 Mm	1 st P.O. day	Raised	Hypotony	NIL	0.045

Table-5: Phthisis bulbi

Total No. of Cases	Average size of graft	Preoperative				Postoperative			P value
		Raised tension	Normal tension	Anterior Synechia	Vascularisation	Shallow A.C.	Aqueous misdirection syndrome	Visual outcome >3/60	
7	8.28	5	2	5	6	1	1	3	.001
23.3%	mm	71%	29%	71%	86%	14.3%	14.3%	49%	

Table-6: Glaucoma

Total No. of cases	Preoperative		Avg. Size of Graft	Postoperative				P value
	Vascularisation	Anterior Synechiae		Raised Tension	Allograft Reaction	Vascularisation	Visual outcome >3/60	
16 53.33%	9 56%	8 50%	8.56 mm	4 25%	7 44%	12 75%	9 56%	0.001

Table 7: Epithelial abnormalities



Figure 1: Infectious keratitis

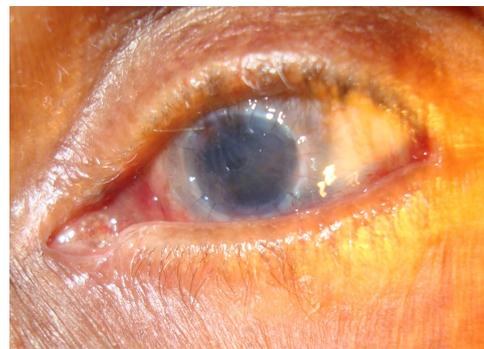


Figure 2: Epithelial defect

Arentsen JJ⁷ found that possible predisposing factors for allograft reaction are pre-existing neovascularisation, postoperative neovascularization, synechiae, and inflammation. Other factors considered were bilateral grafts, repeat grafts, and recipient's age. Hoffmann F et al⁸ evaluated records of 357 patients and found incidence of allograft reaction as 20%. Jiraskova N et al⁹ found incidence of allograft rejection as 23%. Out of 7 cases of allograft rejection only 1 case (14.28%) responded to treatment with corticosteroids and showed final improvement in visual acuity.

The epithelial defects may be due to antigen antibody reactions, increased time interval between preservation to surgery and or increased postoperative intraocular pressure (IOP). In our study, out of 16 cases of epithelial defects (figure 2), 9 cases (56%) had pre-existing vascularisation and 12 cases (75%) had postoperative vascularisation. and 4 cases (25%) had increased IOP. The results of epithelial defects of our study corresponds to the study done by Kim T et al¹⁰ in which 18 cases (45%) out of 40 had epithelial

defect. Out of total 16 cases of epithelial defects, 9 cases (56%) had final improvement in vision.

In our study, 7 cases (23.3%) cases developed postoperative glaucoma. Out of 7 cases, 5 (71%) had pre-existing rise in IOP, 5 cases (71%) had anterior synechiae and 6 cases (86%) had pre-existing vascularisation. Postoperatively, 1 case (14.3%) developed aqueous misdirection syndrome. It was diagnosed on vitreous tap which contained aqueous. Patient was treated with intravenous mannitol and oral acetazolamide along with topical acetazolamide, but visual outcome was poor. Our study corresponds to the study done by Foulks GN et al¹¹ who found that out of 502 penetrating keratoplasty cases performed, occurrence of chronic postoperative glaucoma was 18%. The high incidence of glaucoma is due to preoperative raised tension, vascularisation and presence of anterior synechiae and also due to postoperative shallow anterior chamber which results in formation of peripheral anterior synechiae. Patients were treated with topical antiglaucoma drugs and oral acetazolamide. Final visual improvement

occurred in 3 (49%) out of total 7 cases of glaucoma.

Recurrence of host's disease was observed in 1 case (3.33%) in our study. The patient had recurrence of herpes simplex keratitis in donor graft. Patient was prescribed topical and oral acyclovir 400mg twice a day for one year. Patient had final improvement in vision. Other patients who had history of herpes simplex keratitis were also given acyclovir prophylactically 400mg twice daily for one year. Garcia DD et al[12] also found that prophylactic oral acyclovir use after penetrating keratoplasty for HSV keratitis is associated with decreased episodes of rejection and improved graft survival.

CONCLUSION

Our study concluded that presence of preoperative vascularised corneas result in more prone chances of graft rejection and also patients with preoperative high intraocular pressure have poor graft survival rates. Limitations of the study was the small sample size of the study group due to lack of corneal donation and lack of willingness of patients for corneal replacement. The other limitation consist of visual outcome which was not good in many cases and further research is required to overcome this poor visual outcome of corneal replacement.

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