

A study of graft survival and visual outcome after penetrating keratoplasty at a tertiary eye care institute

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Abstract

Background: Blindness and visual impairment due to corneal diseases is a significant public health problem especially in the developing countries. Visual rehabilitation with penetrating keratoplasty (PK) remains the procedure of choice in these patients. Proper evaluation of donor cornea is critical to the success of corneal transplantation. The proposed study was done to find out visual outcome and graft survival after PK. **Material and Methods:** Patients who underwent penetrating keratoplasties over a period of 12 months were included. The recipient and donor characteristics were noted. The patients were examined at postoperative day 1, 1 month, 3 month and 6 month. Visual acuity, graft clarity and posterior segment were evaluated. **Results:** A total number of 50 eyes of 50 patients were included, out of which 34 patients were male and 16 were female. The mean age of the patients was 52.46 years. Of the 50 patients included 42 patients were of optical and 8 were of therapeutic penetrating keratoplasty. The most common indication for PK in our study was healed corneal opacity. There was marked improvement in the visual outcome in most of the patients during follow up visits. Most of the patients had graft clarity of grade IV which shows good graft survival. **Conclusion:** PK either therapeutic or optical succeeds to meet its purpose in improving the vision of the patient. More studies required with better follow up data and large sample size to analyse the outcomes in our setting.

Key Words: Corneal opacity, Penetrating Keratoplasty, Graft Survival, Visual Outcome.

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INTRODUCTION

Blindness and visual impairment due to corneal diseases is a significant public health problem all over the world, especially in the developing countries¹. In developing countries, infectious conditions such as trachoma and corneal ulcerations are significant causes of corneal blindness². Much progress has been made in recent years

in formulating strategies to combat blindness that is curable and preventable in the developing world. Visual rehabilitation with PK remains the procedure of choice in patients with corneal blindness. Indications of PK have been shown to vary when developed and developing countries are considered³. The causes that might lead to graft failure are donor factors such as the cause of donor death, donor age more than 70 years, prolonged death to preservation time or prolonged donor storage time, endothelial damage during donor retrieval or storage, and surgical factors relating to surgical technique and surgical trauma. The three most commonly reported reasons for graft failure are specifically, rejection, infection and glaucoma¹. The assessment of improved functional vision following transplantation, particularly for unilateral pathology, is complex. Relatively few analyses of corneal graft outcomes include final visual acuity, considering that the majority of PKs are performed for visual rehabilitation. It is also found that there is a

continued improvement in Logarithm of Minimum angle of Resolution (LogMar) visual acuity, contrast sensitivity, and decreased glare following successful postoperative PK. Astigmatism is most commonly seen in patients undergone penetrating keratoplasty⁴. To the best of our knowledge, eye bank in our college is the only eye bank in Uttarakhand and study regarding graft survival and visual outcome after penetrating keratoplasty has not been done in this state, so the proposed study was done to find out visual outcome and graft survival after penetrating keratoplasty.

MATERIAL AND METHODS

This cross sectional follow up study was conducted in the Department of Ophthalmology, Himalayan Institute of Medical Sciences (HIMS), Dehradun, over a period of 12 months. A total number of 50 eyes of 50 patients were included in the present study. Patients aged 10 years and more having corneal opacity due to chemical injury, trauma or healed corneal ulcer, pseudophakic or aphakic bullous keratopathy were included in the study. Patients below 10 years of age with severe dry eye and posterior segment pathology were excluded. The detailed records such as demographic data, previous medical and surgical interventions, indications for the procedure, donor and recipient information were noted. Evaluation of the donor corneal button was done under the slit lamp microscope. A detailed evaluation of the anterior segment, including the cornea as well as the posterior segment evaluation was done of recipient cornea. The examination included best-corrected visual acuity (BCVA). The patients were examined at postoperative day 1, 1 month, 3 month and 6 month. Visual acuity, graft clarity and posterior segment were evaluated.

Statistical Analysis

All analysis of the data was done by SPSS version 19. Descriptive statistics were used to calculate mean

standard deviation for numeric variables. Chi-square was used for analysis of variance.

RESULTS

Of the 50 patients, 34 (68%) were males and 16 (32%) were females. The mean age of patients was 52.46 years. The study included 42 patients of optical and 8 patients of therapeutic penetrating keratoplasty. The most common indication of PK in the present study was corneal opacity (42%) followed by endothelial decompensation following cataract surgery (18% patients had pseudophakic bullous keratopathy and 4% patients had aphakic bullous keratopathy). Acute infectious keratitis was seen in 8% patients, corneal dystrophy in 2%, corneal degeneration in 2% and failed graft in 6% patients. Forty (80%) out of 50 donor cornea were B+ grade and only 5 (10%) were of A grade. The various pre-operative risk factors present in our study group were corneal neovascularisation in 39 patients (78%), pre-existing glaucoma in 7 patients (14%), previous graft failure in 6 patients (12%), peripheral anterior synechiae (PAS) in 5 patients (10%) and 4 patients (8%) had anterior staphyloma. No significant correlation of the age of the recipient or donor with the graft clarity at the 6 monthly follow up was seen. Although, there was a positive and statistically significant correlation of the donor age and the BCVA (Log Mar) at 6 months follow-up. That indicates the patients whose corneal grafts belonged to lesser age group showed better visual outcome at 6 months. In the present study, the death to enucleation time, cornea size, grade of the donor cornea, lens status did not affect BCVA (Log Mar) and graft clarity at 6 months follow-up whereas better graft clarity was observed in small sized donor cornea. Factors influencing BCVA and graft clarity are depicted in Table 1.

Table 1: Multifactorial analysis of graft clarity and BCVA at 6 month follow-up

SN	Factor	Graft clarity				F value	P value	BCVA	
		1	2	3	4			R	P value
1	Recipient age	49.56 ± 14.21	57.82 ± 13.96	52.78 ± 17.16	50.76 ± 20.03	0.499	0.685	-0.005	0.973
2	Donor age	76.78 ± 15.80	76.00 ± 13.71	71.89 ± 13.36	68.10 ± 12.71	1.260	0.299	0.354	0.012
3	Death-enucleation time	231.67 ± 107.1	196.36 ± 81.73	195.00 ± 9.05	187.62 ± 87.00	0.683	0.683	0.123	0.396
4	Donor size	8.89 ± 1.24	8.46 ± 1.04	7.78 ± 0.51	7.95 ± 0.42	-4.219	0.010	0.267	0.061
5	Grade of cornea								
	A		0(0%)	0(0%)	4(19.0%)	12.082	0.060	-0.056	0.700
	B+	1(11.1%)6(66.7%)	8(72.7%)	9(100%)	17(81%)				
B-	2(22.2%)	3(27.3%)	0(0%)	0(0%)					
6	Donor lens status								
	Pseudophakic	6(66.7%)	9(81.8%)	7(77.8%)	13(61.9%)	4.399	0.623	-0.074	0.609
	Phakic	3(33.3%)	1(9.1%)	1(11.1%)	7(33.3%)				
Aphakic	0(0%)	1(9.1%)	1(11.1%)	1(4.8%)					

Maximum number of the patients had successively improved BCVA (LogMar) at every follow up (Fig. 1). In most of the patients, there was a gradual improvement of BCVA from pre operative BCVA to 1 month follow up

and from 1 month follow up BCVA to 3 months follow up and from 3 months follow up BCVA to 6 months follow up.

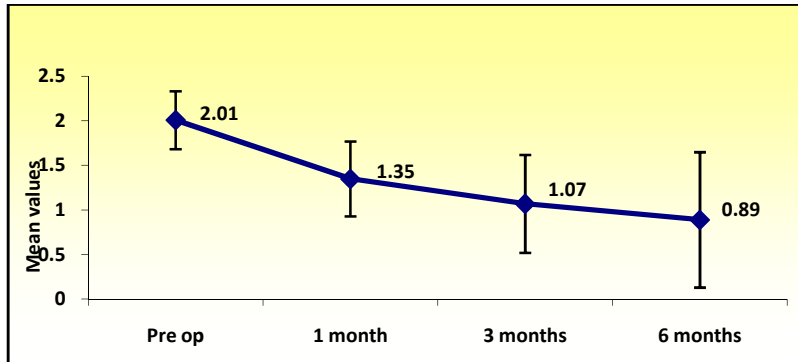


Figure 1: Trend of BCVA over a period time

There was a marked improvement in the preoperative and 6 months follow up visual acuity. Most of the patients had remarkably improved visual acuity at 6 months follow up. The trend of graft clarity gradually improved after each

follow up for most of the patients. Out of 50, 42% patients had grade 4 graft clarity at 6 months follow up (Fig. 2-4).

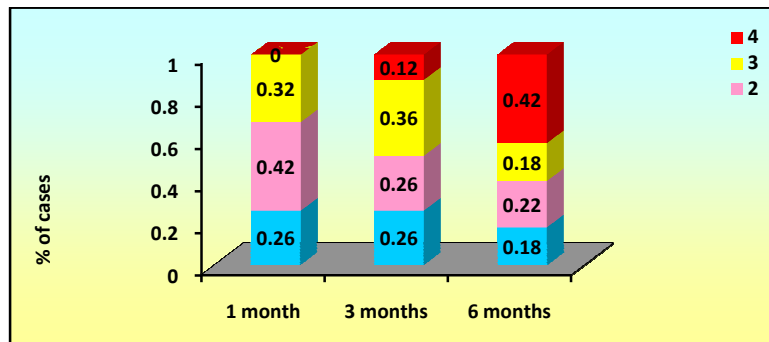


Figure 2: Comparison of Graft clarity at different time points



Figure 3: Graft Clarity Grade IV



Figure 4: Graft Clarity Grade II

The post operative complications in our study were glaucoma in 12 patients (24%), graft infection in 8 patients (16%) and primary graft failure in 2 patients (4%).

DISCUSSION

Penetrating keratoplasty is one of the most commonly performed tissue transplants today and it is said to be the most successful solid organ transplants. The present study was undertaken to see the graft survival and the visual

outcome in patients undergoing penetrating keratoplasty. Male preponderance was observed in present study, Dandona L *et al* and Varghese A *et al* also showed a male preponderance with 69% and 60.93% respectively^{5,6}. The most common indication for PK in our study was corneal opacity both following previous trauma and healed keratitis which was seen in 42% patients followed by pseudophakic bullous keratopathy seen in 18%. Kumari A *et al* and Tabin *et al* also observed corneal opacity as the indication for PK in 40% and 39% respectively with pseudophakic bullous keratopathy as second most common in 17.5% and 18% cases respectively^{7,8}. The main preoperative recipient risk factors was corneal neovascularisation with an incidence of 78% in our study. Tabin *et al* also found neovascularisation in 60%⁸. recipient age was not responsible for the outcome of PK, study conducted by Joshi *et al* [9] also found that recipient age was not responsible for the outcome of PK whereas Keryn *et al* showed that the graft survival was better with increasing recipient age¹⁰. Most of the subjects were concentrated in a specific age group in the present study leading to biased results. Better post PK visual outcome were noted in PKs with younger donors, although donor age did not seem to affect graft clarity. Comparable results were seen by Mannis *et al*¹¹. It was observed that grade and size of donor cornea did not influence the visual outcome or graft survival, however, studies by Joshi *et al* and Rahman *et al* contradict these observations as they found that grade of donor cornea significantly affects these outcomes because of better cell count and longer viability^{9,12}. Our observations could be biased due to lesser number of total subjects and also the scarcity in the availability of A grade cornea in our region. In our study, there was an increasing improvement trend in the BCVA over a period of 6 months in maximum number of our patients. A similar trend of improving BCVA (LogMar) was seen in a study conducted by Borderie VM *et al*¹³. The trend of graft clarity also showed marked improvement by the end of our last follow up session. Most of the patients in our study group (42%) had grade 4 graft clarity. A similar trend was observed in a study conducted by Joshi *et al* [9]. At all the follow up visits, when we compared the number of patients in each graft clarity grade wise with corresponding mean BCVA (LogMar) at that particular point of time, it was seen that as a grade of graft clarity became better with time, there was improvement in BCVA (LogMar) in those patients given that there was no post-operative complications or pre-existing posterior segment pathology in those patients. The results of this comparison were similar to the results of a study conducted by Beckingsale P¹⁴ and a study conducted by Dandona L *et al* regarding the survival analysis and visual outcome in PK¹⁵. The post

operative complications seen in our study group were glaucoma in majority (24%) of patients followed by graft infection (16%). A similar pattern of complications was seen in a study conducted by Dodia KR *et al* and Al-Mezaine and Wagoner in which secondary glaucoma was seen in 30% and 28% patients respectively^{16,17}. In conclusion, PK either therapeutic or optical succeeds to meet its purpose in improving the vision of the patient. The major drawback of our study would be loss of follow up after the 6 months along with smaller sample size and the grade of the available donor cornea. Irrespective of whether optical or therapeutic reasons we need more studies with better follow up data to analyse the outcomes in our setting.

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