

# Indications and Outcomes of Penetrating Keratoplasty at a Tertiary Hospital in Bangladesh

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## ABSTRACT

**Purpose:** To study the indications and outcomes of Penetrating Keratoplasty at a tertiary eye hospital in Dhaka, Bangladesh.

**Study Design:** Retrospective hospital based study.

**Place and Duration of Study:** Ispahani Islamia Eye Institute and Hospital, Dhaka, Bangladesh from July 2011 and July 2018.

**Methods:** In this study, data was collected from the records of patients, who came for treatment at the cornea unit. Pre-operative evaluation and post-operative follow-up record was analyzed. Patients' demographic information, visual acuity, management, pre and post-operative complications, follow-up visits and outcomes were recorded. A technical research team headed by a senior consultant determined the content validity and their comments were incorporated in finalizing the research instruments.

**Results:** A total of 213 penetrating keratoplasties (PK) were performed during the study period. The main indications were keratoconus (8.28%), Corneal scarring (41.42%), Adherent leucomas (25.59%), corneal dystrophy (3.84) and bullous keratopathy (7.25%). Rejection rates at 8 years were 5.62%. Keratoconus showed the best graft survival (79%). The percentage of patients with post-transplant best-corrected visual acuity of 6/36 at 8 years was 52%. There was a statistically significant reduced rejection rate in males.

**Conclusion:** Penetrating Keratoplasty is an effective treatment option for improving visual outcomes for people with visual impairment. There are many co-factors involved in quality outcome of patients with Penetrating Keratoplasty such as immunological rejection, microbial keratitis and level of patient awareness, which continue to limit the success.

**Key Words:** Penetrating, Keratoplasty, Bangladesh, Keratoconus, Corneal Dystrophy.

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## INTRODUCTION

Penetrating Keratoplasty (PK) is an advanced surgical treatment for corneal disorders secondary to trauma, chemical burns and infectious diseases, as well as congenital disorders of cornea. PK is considered as a good option for management of corneal opacity.<sup>1</sup> It is the most common tissue transplant technique in the developed countries and this treatment has become popular in developing countries as well due to significantly high percentage of visual impairment and

blindness in these countries. Recent evidence shows that corneal transplantation has good outcomes among pediatric patients.<sup>2-4</sup> Outcomes of PK depend on graft survival times, graft survival rates and other significant prognostic factors.<sup>5-7</sup> Very recent studies in Pakistan showed that keratoconus was the most common indication for PKP, followed by Fuch's endothelial dystrophy, bullous keratopathy, viral keratitis, other corneal dystrophies, and mechanical trauma.<sup>8</sup> In earlier studies, the prognostic factors for the visual outcome were age, time of primary graft, surgical indication, unilateral versus bilateral grafts, other ocular surgeries and follow-up timing.<sup>9</sup>

In this study, we have evaluated the indications and outcomes of PK in Bangladeshi population.

## METHODS

This was a retrospective hospital based study and data was collected from the records of patients, who came for treatment at the cornea unit between July 2011 and July 2018. Ethical review committee of the hospital unanimously approved the proposal. A total of 213 eyes were included in this study. Hospital information system and International Classification of Diseases (ICD) were used to retrieve medical records of the patients. The study was under taken in the cornea unit of the Ispahania Islamia Eye Institute and Hospital, Dhaka, Bangladesh. Pre-operative evaluation and 60 months post-operative follow-up record was analyzed. A total 213 patients with age ranging from 3 to 77 years were included in the study. Patients demographic information, visual acuity, management, pre and post-operative complications, follow-up visits and outcomes were recorded in the self-designed proforma. A technical research team headed by a senior consultant determined the content validity and their comments were incorporated in finalizing the research instruments.

All patients who had undergone PK and had full pre-operative evaluation and post operative follow-up records of at least 12 months were included. We excluded the patients who had undergone lamellar KP, therapeutic keratoplasty, repeat KP, DALK, cosmetic keratoplasty and lack of follow-up record.

The outcomes of graft transparency were recorded and visual acuity was classified according to the World Health Organization (WHO) recommended categories of visual loss. Blindness was defined as vision of less than 6/60 to Perception of light. SPSS

version 24 was used for analyzing the data. The qualitative data was manually analyzed. Quantitative data was entered into the computer for analysis. Both univariate and bivariate tables were used. Frequency distribution, measurement of central tendency (mean, median, and mode), measures of dispersion (Standard deviation), and non-parametric tests (Chi-square, Cramer's V) were recorded. The level of significance was set at 0.05.

## RESULTS

The study included both male and female patients but male patients were more (69%) than the female patients (31%). The mean age was 34.75 ( $\pm$ ) years (table 1). The graft survival rates were highest among male patients (55.42%) compared to females (24.41%). Table 2 shows the indications for surgery and table 3 shows details of the results. There was at least six-month follow-up available for 91% (N = 193) patients and maximum follow-up of 8 years was available for only 7% (N = 13) patients. Avascular recipient cornea had the best 8-year survival rate. Recipient with age younger than 50 years showed better 8-year survival rate as compared to recipients older than 50 years. Keratoconus had best graft survival. A significant correlation was observed between graft-rejection and age ( $r = 0.153$ ;  $R^2 = 0.023$ ;  $P = .048$ ), with a mean age of 10.84 + 4.80 years at rejection.

The average donor graft diameter was 8 mm (range 7 mm to 8.50 mm). Majority of the grafts were performed with an interrupted suture technique. Fifty-three patients had concurrent extra-capsular cataract extraction at the time of Keratoplasty, an additional 12 had intraocular lens (IOL) exchange and one patient

**Table 1:** Percentage Distribution of Age of the PK Surgery Patients by Sex.

Age Categories	Male N = 148 Percentage	Female N = 65 Percentage	Total = 213 Percentage
3 – 18 years	19.10	25.50	17.40
19 – 35 years	36.30	33.80	40.30
36 – 60 years	26.10	38.90	32.90
61+ years	18.50	1.8	9.40
Total	100.0	100.0	100.0
Mean	17.68	11.76	-
St. deviation	7.17	14.22	12.22

$X^2 = 23.782$ ; Gamma V = .229; df = 13; Gamma = -0.321; Sig: P = < .05

had IOL explanation. The most common intra-operative complication was vitreous loss.

Best corrected visual acuity is shown in table 4. Considering the univariate analysis, preservation status and time between death and transplant showed a significant effect for PK. Donor age, donor sex, and time between death and enucleation showed no significant influence. Both graft diameter and effect of combined surgery were significant in univariate analysis. Graft diameter between 7.0 and 7.5 mm as well as between 8.0 and 8.50 mm showed the best 8-

year survival estimate, followed by diameters of 7.5 to 8.00 mm.

## DISCUSSION

Penetrating Keratoplasty in developing countries is a challenging surgery, not only regarding the surgical procedure, but also during follow-up and rehabilitation. The patients of Penetrating Keratoplasty tend to be young, with a mean age of 17.68 years (range 3–77 years). The high prevalence of allergic eye disease and use of contact lens wear in the dry and dusty conditions in our region are factors which account in part for the great preponderance of Keratoconus patients. The graft survival rate at one and two years after surgery is around 80% and 67%, respectively.<sup>10</sup> Reports on 5 – year graft survival range from 50% to 91%, depending on the series.<sup>11</sup> In our study, 2 – year graft survival was 73%, and 5 – year graft survival was 44%, which is consistent with the graft survival rates reported in other tertiary eye care centers.<sup>12</sup> Similarly, our graft survival rate for Keratoconus was higher compared with the rest of indications ( $P = .0001$ ). Graft survival rates for Keratoconus patients varied between genders in the first 3 years: females presented a higher graft rejection with a peak at 24 months after the procedure; nevertheless, at 28 months this difference was no longer observed.<sup>13,14</sup> A gender difference in the survival of graft in children has not been reported although there are some studies showing significant adult differences. The Australian Corneal Graft Registry and The Canadian Corneal Graft Outcome study reported statistically significant gender differences in adults, showing that females were more likely to have a rejection event compared with males.<sup>15</sup> However, the causes of these differences were not discussed. Another proposed explanation is the augmented activity of the immune system in females that increases the incidence of autoimmune conditions.<sup>16</sup> One possible mechanism to understand why there are higher numbers of rejection events among young women could be the mismatching between donor gender and recipient. A study published in the American Journal of Transplantation indicated poorer outcomes in women who received corneas from males.<sup>17</sup> The study explained that this effect, only observed in females, could be a consequence of H-Y antigen incompatibility related to the Y chromosome. Lack of Y chromosome allows compatibility from female donors to male recipients.<sup>18</sup>

**Table 2:** Indications for Penetrating Keratoplasty ( $n = 213$ ).

Indication	Percent (%)
Corneal scarring (trauma related)	41.42
Adherent leukomas	25.59
Keratoconus	8.28
Bullous keratopathy	7.25
Corneal dystrophy	3.84
Pseudophakic	5.81
Congenital Hereditary Endothelial Dystrophy	6.00
DMD	1.81
Total	100

**Table 3:** Percentage Distribution of Gender Wise Graft Survival, Graft Rejection and Graft Failure.

Types of Graft	Male Percentage	Female Percentage	Total = 213 Percentage
Graft survival	55.42 (N = 117)	24.41 (N = 52)	79.83 (N = 169)
Graft Rejection	3.75 (N = 8)	1.87 (N = 4)	5.62 (N = 12)
Graft Failure	6.57 (N = 14)	7.80 (N = 16)	14.35 (N = 30)
Total	65.74 (N = 139)	33.79 (N = 72)	100 (N = 213)
Mean	21.91	11.26	-
St. deviation	23.72	9.54	-

$X^2 = 26.66$  Gamma V = .492; df = 9; Sig; P = < .002

**Table 4:** Post-operative Best Corrected Visual Acuity (BCVA).

Best Corrected Visual Acuity (BCVA)	Percent (%)
6/6 – 6/12	38.00
6/18 – 6/36	14.75
6/60 – FC	22.56
HM	20.23
PL	4.46
Total	100

$x^2 = 14.28$ , df = 25, Sig. = .05

In addition, steroid hormones are implicated in the susceptibility of female graft rejection. Regarding indications for Keratoplasty, similar to other series, Keratoconus was the leading indication for transplant in over half of the patients.<sup>19</sup> Literature shows that less frequent pathologies like Peters anomaly, Sclerocornea, and Axenfeld–Rieger syndrome had the worst outcomes with high rejection rates.<sup>20</sup> Age is another important factor associated with success or failure of penetrating keratoplasty. It has been established that older children have a better prognosis.

Limitation of our study was the retrospective design. Surgeries were not performed by a single surgeon which can be a cause of bias. More prospective trials are needed to better identify the indications, prognostic factors and outcomes of KP.

## CONCLUSION

Penetrating Keratoplasty has been considered effective treatment option for improving visual outcomes for people with visual impairment. There are many co-factors involved with a quality outcome of patients with Penetrating Keratoplasty such as immunological rejection, microbial keratitis and level of patient awareness, which continues to limit the success.

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## Ethical Approval

All study materials, including research protocols, were approved by the Research Committee of Ispahani Islamia Eye Institute and Hospitals.

## Conflict of Interest

Authors declared no conflict of interest.

## REFERENCES

1. Ganekal S, Gangangouda C, Dorairaj S, Jhanji V. Early outcomes of primary pediatric keratoplasty in patients with acquired, atraumatic corneal pathology. *J AAPOS*. 2011; **15**: 353–355.
2. Karadag R, Chan TC, Azari AA, Nagra PK, Kristin M., Hammersmith KM, et al. Survival of primary penetrating keratoplasty in children. *Am J Ophthalmol*. 2016; **171**: 95–100.
3. Majander A, Kivelä TT, Krootila K. Indications and outcomes of keratoplasties in children during a 40-year period. *Acta Ophthalmol*. 2016; **94**: 618–624.
4. Low JR, Anshu A, Tan AC, Htoon HM, Tan DTH. The outcomes of primary pediatric keratoplasty in Singapore. *Am J Ophthalmol*. 2014; **158**: 496–502.
5. Hovlykke M, Hjortdal J, Ehlers N, Nielsen K. Clinical results of 40 years of paediatric keratoplasty in a single university eye clinic. *Acta Ophthalmol*. 2014; **92**: 370–377.
6. Rao KV, Fernandes M, Gangopadhyay N, Vemuganti GK, Krishnaiah S, Sangwan VS. Outcome of penetrating keratoplasty for Peters anomaly. *Cornea*. 2008; **27**: 749–753.
7. Basdekidou C, Dureau P, Edelson C, De Meux P, Caputo G. Should unilateral congenital corneal opacities in Peters' anomaly be grafted? *Eur J Ophthalmol*. 2011; **21**: 695–699.
8. Chaudhry T, Sadiq SN, Sirang Z, Syed MA, Kamal M, Ahmad, K. A 10 – year review of indications for penetrating keratoplasty in a tertiary care setting in Karachi Pakistan. *J Pak Med Assoc*. 2016; **66** (10): S84–S86.
9. Dana MR, Moyes AL, Gomes JA, Rosheim KM, Schaumberg DA, Laibson PR, et al. The indications for and outcome in pediatric keratoplasty. A multicenter study. *Ophthalmology*, 1995; **102**: 1129–1138.
10. Thompson RW, Price MO, Bowers PJ. Long-term graft survival after penetrating keratoplasty. *Ophthalmology*, 2003; **110**: 1396–1402.
11. Sharma N, Prakash G, Titiyal JS, Tandon R, Vajpayee RB. Pediatric keratoplasty in India: indications and outcomes. *Cornea*, 2007; **26**: 810–813.
12. Oertelt-Prigione S. The influence of sex and gender on the immune response. *Autoimmun Rev*. 2012; **11**: A479–485.
13. Hopkinson CL, Romano V, Kaye RA, Steger B, Stewart RMK, Tsagkatakis M, et al. The influence of donor and recipient gender incompatibility on corneal transplant rejection and failure. *Am J Transplant*. 2017; **17**: 210–217.
14. Haskova Z, Filipec M, Holan V. The significance of gender incompatibility in donors and recipients and the role of minor histocompatibility antigens in corneal transplantation. *Cesk Slov Oftalmol*. 1997; **53**: 128–135.
15. Costenbader KH, Gay S, Alarcon-Riquelme ME, Iaccarino L, Doria A. Genes, epigenetic regulation and environmental factors: which is the most relevant in developing autoimmune diseases? *Autoimmun Rev*. 2012; **11**: 604–609.

16. **Patel HY, Ormonde S, Brookes NH, Moffatt LS, McGhee CNJ.** The indications and outcome of paediatric corneal transplantation in New Zealand: 1991 – 2003. *Br J Ophthalmol.* 2005; **89**: 404–408.
17. **Groh MJ, Gusek-Schneider GC, Seitz B, Schönherr U, Naumann GO.** Outcomes after penetrating keratoplasty in congenital hereditary corneal endothelial dystrophy (CHED). Report on 13 eyes]. *Klin Monbl Augenheilkd.* 1998; **213**: 201–206.
18. **Erllich CM, Rootman DS, Morin JD.** Corneal transplantation in infants, children and young adults: experience of the Toronto Hospital for Sick Children, 1979–1988. *Can J Ophthalmol.* 1991; **26**: 206–210.
19. **Hong JX, Xu JJ, Sheng MJ, Zhu YLL.** Pediatric penetrating keratoplasty in Shanghai: a retrospective multiple centre study from 2003 to 2007. *Chin Med J (Engl).* 2008; **121**: 1911–1914.
20. **Lowe MT, Keane MC, Coster DJ, Williams KA.** The outcome of corneal transplantation in infants, children, and adolescents. *Ophthalmology,* 2011; **118**: 492–497.

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