SHORT REPORT

A 10-year review of indications for penetrating keratoplasty in a tertiary care setting in Karachi Pakistan

Tanveer Ajum Chaudhry, Salman Naveed Sadiq, Zubaida Sirang, Maheen Akhtar Syed, Mustafa Kamal, Khabir Ahmad

Abstract

The retrospective study was conducted to determine the indications and outomes of penetrating keratoplasty(PKP) in a tertiary care setting in Pakistan. All eyes that had undergone PKP between January 2005 and December 2014 at the Aga Khan University Hospital, Karachi, were included.Data were collected on the indications of PKP, graft survival (graft clarity at final follow-up), and best corrected visual acuity (BCVA).Kaplan-Meier's method was usedto analyse graft survival.Out of 437 eyes, 383(87%) were for visual purpose. Trauma-related corneal scarring 113(26.2%) was the leading cause of PKP, followed by keratoconus 74(17.1%), redo graft 56(13%), infection-related corneal opacity 46(10.6%), corneal dystrophy 44(10.2%) and bullous keratopathy 36(8.3%). The probability of graft survival at 30 months was 90% for keratoconusversus 75% for the non-keratoconus grafts. Most of the PKPs in this case series were due to preventable causes. Our long-term PKP results were favourable, with a graft survival ratecomparable to those of other centres.

Keywords: Penetrating keratoplasty, Indication, Graft survival, Keratoconus, Outcome, Case series.

Introduction

Penetrating keratoplasty (PKP) is the most common tissue transplant performed worldwide.[1] There are multiple indications for this procedure. A study[2] found keratoconusto be the most common indication for PKP, followed by Fuch's endothelial dystrophy, bullous keratopathy, viral keratitis, other cornealdystrophies, and mechanical trauma. Outcomes of PKP depend upon the indication. Patients with keratoconushave better outcomes than those with other indications.[1]

There is limited data on the indications and outcomes of PKP in Pakistan, although it is a commonly performed surgical procedure today.[3] We planned this study to determinethethe indications and outcomes of PKP in a tertiary care hospital in an urban setting.

Section of Ophthalmology, Department of Surgery, Aga Khan University, Karachi.

Correspondence: TanveerAjum Chaudhry. Email: tanveer.chaudhry@aku.edu

Methods and Results

This retrospective study was conducted at the Aga Khan University Hospital (AKUH), Karachi,and comrpsied all PKP procedures done from January 2005 to December 2014. Approvalwas taken from the institutional review committee. Hospital information system and International Classification of Diseases (ICD)[4] were used to retrieve medical records of the patients. Data was obtained on patients'age, gender, indication for the procedure, and pre- and post-operative visual acuity (VA).

SPSS 19 was used to analyse data. Snellen's VA values were converted to logarithm of the minimum angle of resolution (logMAR) values. Means with standard deviation (SD) were computed to describe continuous data. Frequencies and percentages were calculated to describe nominal data. Kaplan-Meier method was used to determine the probability of graft survival at 1, 2 and 5 years. $P<0.05$ was considered statistically significant.

Of the 437 PKPs performed, 261(60.4%) involved male eyes and 171(39.6%) female eyes. The mean age at the time of surgery was 34.50±19.12 years. The most common reason for a corneal transplant was optical 383(87%) which included trauma-related corneal scarring, keratoconus, redo graft, corneal opacity post-infection, corneal dystrophy and bullous keratopathy (Table-1). The other mostcommon reasons were restoration of anatomy (tectonic) due to perforated corneas 36(8.3%) and treatment of infectious keratitis 8(1.9%).

Table-1: Indications for penetrating keratoplasty (n= 437).

Indication	Freq	%
Corneal scarring (trauma-related)	113	26.2
Keratoconus	74	17.1
Redo graft	56	13.0
Corneal Opacity Post -infectious	46	10.6
Corneal dystrophy	44	10.2
Bullous Keratopathy	36	8.3
Corneal perforation	32	7.4

Table-2: Complications of penetrating keratoplasty (n=437).

Complications	Freq	%
Loose Suture	117	27.1
Secondary Graft Failure	94	21.8
Post Op Glaucoma	69	19.0
Primary Graft Failure	59	13.7
Persistent Epithelial Defect	56	13.2
Microbial Keratitis	31	7.2
Wound Leak	12	2.8
Endophthalmitis	4	0.9

The mean pre-operative best corrected visual acuity (BCVA) was 0.74±0.36 logMAR which improved to 0.84 ± 0.89 at the final follow-up.The graft survival was 80%, 76% and 51% at 1, 2 and 5 years, respectively. Keratoconushad the highest survival rate. The probability of survival at 30 months among the keratoconus grafts was 90% and in the non-keratoconus grafts 75%. This difference continued untilthe final follow-up at 5 years. Tectonic PKPs showed the least survival rates of 38.7% at final follow up.

Loose suture, present in 117(27.1%) grafts, was the most common complication. Secondary graft failure was seen in 94(21.8%) grafts, and 59(13.7%) failed to clear in post-operative period leading to primary graft failure (Table-2).

Conclusion

In our study, PKP was performed at a relatively younger age group compared to the developed countries. In a study, mean age at the time of surgery was 56.7 years.[5] This difference can be explained by the fact that more young individual suffer from corneal blindness secondary to corneal infections, and trauma in developing countries.

Corneal scarring was the most common indication in our study. This is consistent with several studies from the developing world.[3,5,6] A large study from northern India (n=2022) found that 38.3% PKPs were performed for corneal scarring.[7] Healed infectious keratitis (19.8%) was the most common subcategory among the eyes with corneal scarring followed by traumatic corneal scars (16.7%). However, in our study traumatic corneal scarring (26.2%) was most common followed by healed infectious keratitis (10.6%). Keratoconus was second most common indication (17.1%) for PKP in our study. This is again consistent with the results from developing countries. Studies from developed countries have shown a gradual decrease in PKPs for keratoconus over the past decade.[8] This is mainly because of the development of a newer surgical technique called Deep Anterior Lamellar Keratoplasty (DALK). A recent audit study form the United Kingdom reported that about two-thirds of keratoconus patients undergo DALK operations.[8] In our region, due to lack of DALK services, PKP is still commonly performed to treat keratoconus. Our study observed regraft proportion of 13% which is significantly lower than results observed in some other studies. A study in UK reported 40.9% of graft surgeries to be regrafts.[2] Similarly, another study in the United States found 22% to be re-grafts.[9] Low regrafting rate in our study is possibly due to financial and religious implications that prevent people from going for re-graft.

Quantifying improved functional vision after PKP is complex and depends upon several factors. Only few studies have reported mean gain in logMar BCVA after successful transplantation. In a study 48% patients achieved BCVA of 6/12 or better at 5-yearfollow-up.[5] A similar cohort reported a BCVA of 6/18 or better in 50% patients over 5 years.[10] Considering variations in the indications, comparing the BCVA between different studies is not easy.

Overall survival rate of corneal grafts in our study was comparable with most studies. It was slightly higher than reported by large-scale studies from developing world and slightly lower than studies from the developed world. A large series involving 1725 cases from India reported 79.6%, 68.7% and 46.5% survival rates at 1, 2 and 5 years respectively.[1] Our study observed 80%, 76% and 51% survival rates at 1, 2 and 5 years respectively.

The grafts performed for keratoconus were the most successful in terms of graft survival — survival rate of 83.8% in terms of graft clarity at final follow-up. A study reported a similar success rate of 88.9% in keratoconus patients.[3] In our study the graft survival was significantly different between keratoconus and non-keratoconus indications. High success rate in keratoconus patients is attributed to multiple factors. Firstly, these patients tend to be young and otherwise healthy. Secondly, they don't have any pre-existing ocular pathology like corneal vascularisation or infection that can lead to graft failure. Moreover, it is a common observation that these patients are grafted with relatively young donor graft with healthy endothelial cell count. Overall, 38.7% patients who underwent PKP secondary to corneal perforation survived post-operatively at final follow-up. A study observed 85.4% anatomical and 70.7% visual success at one-year follow-up in patients undergoing tectonic PKP.[11] These reassuring results emphasise the need to perform urgent PKP for corneal perforation; which otherwise may end up in evisceration. Knowing relative success rates of corneal graft for individual indications is helpful in giving patients more realistic expectations regarding post-operative outcomes.

Post-operative complications are most crucial towards the outcome of graft. High number of subjects (13.7%) in our study suffered from primary graft failure. This is significantly higher percentage of primary failure compared to other local studies.[3] This is probably related to poor-quality donor tissue with low endothelial cell count. Other possible explanation may be that high percentage of high-risk PKPs were performed.

Most of the PKPs in our study were due to preventable causes.

References

1. Dandona L, Naduvilath TJ, Janarthanan M, Ragu K, Rao GN. Survival analysis and visual outcome in a large series of corneal transplants in India. Br J Ophthalmol 1997; 81: 726-31.
2. Al-Yousuf N, Mavrikakis I, Mavrikakis E, Daya SM. Penetrating keratoplasty: indications over a 10 year period. Br J Ophthalmol 2004; 88: 998-1001.
3. Bhatti MN, Zaman Y, Mahar PS, Rahman A, Kamal MF. Outcome of penetrating keratoplasty from a corneal unit in Pakistan. Pak J Ophthalmol 2009; 25: 152-9.
4. International Classification of Diseases, World Health Organization, Geneva, 2012. Geneva.
5. Rahman I, Carley F, Hillarby C, Brahma A, Tullo AB. Penetrating keratoplasty: indications, outcomes, and complications. Eye (Lond) 2009; 23: 1288-94.
6. Dandona L, Ragu K, Janarthanan M, Naduvilath TJ, Shenoy R, Rao GN. Indications for penetrating keratoplasty in India. Indian J Ophthalmol 1997; 45: 163-8.
7. Sony P, Sharma N, Sen S, Vajpayee RB. Indications of penetrating keratoplasty in northern India. Cornea 2005; 24: 989-91.
8. Keenan TD, Jones MN, Rushton S, et al. Trends in the indications for corneal graft surgery in the United Kingdom: 1999 through 2009. Arch Ophthalmol 2012; 130: 621-8.
9. Ghosheh FR, Cremona F, Ayres BD, et al. Indications for penetrating keratoplasty and associated procedures, 2001-2005. Eye Contact Lens 2008; 34: 211-4.
10. Beckingsale P, Mavrikakis I, Al-Yousuf N, Mavrikakis E, Daya SM. Penetrating keratoplasty: outcomes from a corneal unit compared to national data. Br J Ophthalmol 2006; 90: 728-31.
11. Vanathi M, Sharma N, Titiyal JS, Tandon R, Vajpayee RB. Tectonic grafts for corneal thinning and perforations. Cornea 2002; 21: 792-7.