

Outcome of Penetrating Keratoplasty from a Corneal Unit in Pakistan

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Pak J Ophthalmol 2009, Vol. 25 No. 3

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Received for publication
November' 2008

Purpose: To evaluate the outcome of penetrating keratoplasty (PKP) at a corneal unit in Pakistan.

Material and Methods: Penetrating keratoplasty (PKP) alone or triple procedure (PKP combined with extracapsular cataract extraction and intraocular lens implantation) was performed in 30 eyes of 30 patients at Al-Ibrahim Eye Hospital/Isra Postgraduate Institute of Ophthalmology, Karachi from January 2003 to December 2007. The outcome was evaluated in terms of graft survival (number of clear grafts at final follow-up) and final best-corrected visual acuity.

Results: Out of 30 patients underwent PKP. 73.3% were male and 26.7% female. Mean recipient age was 38.1 years (range 14-82). Leading indication of PKP was corneal scar (46.7%). PKP alone was performed in 70% patients and 30% patients had triple procedure. Mean follow-up period after surgery was 12.3 months (range 1-36). Overall graft survival was 61%. Excluding failed grafts, final best-corrected visual acuity achieved was: 20/40 or better in 33.3% patients, 20/50 - 20/150 in 41.7% patients and 20/200 or worse in 25% patients. Keratoconus had most favorable outcome with graft survival of 88.9% and final visual acuity of 20/40 or better in 55.6% patients. Graft survival and final best-corrected visual acuity of 20/40 or better in remaining indications were, corneal scar (78.6% & 14.3%), pseudophakic bullous keratopathy (75% & 25%), and other indications (66.7% & 0.0%).

Conclusion: This series showed that PKP is an effective procedure for corneal disease with poor vision. Visual outcome was good especially in cases of keratoconus.

Penetrating keratoplasty is a corneal transplant procedure in which full thickness host corneal tissue is replaced with donor corneal tissue¹. Aims of PKP include improvement in visual acuity, pain relief or even simply saving an eye. But visual improvement is the objective of majority of corneal grafts. Advances in the field of microsurgery, ocular immunity and eye banking have made PKP one of the most common transplant procedures in the world²⁻⁴. Corneal opacity is the second leading cause of blindness, identified in a recent survey conducted in Pakistan⁵. The purpose of this study was to evaluate the outcome of PKP at a corneal unit in Pakistan.

MATERIAL AND METHODS

All the patients underwent penetrating keratoplasty (PKP) at Al-Ibrahim Eye Hospital/Isra Postgraduate Institute of Ophthalmology, from January 2003 to December 2007 were included.

Age, gender, eye, indication of PKP and best-corrected visual acuity constituting the preoperative data were recorded in a predesigned proforma. The type of procedure was defined as PKP alone and triple procedure (PKP combined with an extracapsular cataract extraction and intraocular lens implantation).

Postoperative data included the length of follow-up time after surgery (patients were followed until they lost to follow-up or died), graft clarity at final follow-up, final best-corrected visual acuity and complications. Graft survival was defined as number of clear grafts at final follow-up and graft failure as number of grafts with irreversible loss of optical clarity.

Data Analysis

Data analysis was done by SPSS (10.0 version). Related frequencies and percentages were calculated. Mean was calculated for age and length of follow-up period after surgery. Kaplan-Meier curve was plotted to estimate the cumulative probability of graft survival. Chi-square test was used to compare the graft survival and final best-corrected visual acuity with other studies. The level of significance was set at 5%.

RESULTS

Thirty eyes of thirty patients underwent PKP during 5 years study period. Mean recipient age was 38.1 years (range 14-82). There were more males 22 (73.3%) as compared to females 08 (26.7%) (Table 1). Leading indication of PKP was corneal scar 14 (46.7%) followed by keratoconus 09 (30%) and pseudophakic bullous keratopathy 04 (13.3%) (Table 2).

Preoperative best-corrected visual acuity in all patients was 20/200 or worse. PKP alone was performed in 21 (70%) patients and 09 (30%) patients had triple procedure. Mean follow-up period after surgery was 12.3 months (range 1-36).

Overall graft survival was 61.0% at the final follow-up (mean 12.3 months). See Figure-1. Eyes with keratoconus had highest graft survival 08 (88.9%),

followed by corneal scar 11 (78.6%), pseudophakic bullous keratopathy 03 (75.0%) and other indications 02 (66.7%).

Table 1: Characteristics of patients underwent PKP

Characteristics	No. of patients n (%)
Right eye	16 (53.3)
Left eye	14 (46.7)
Male	22 (73.3)
Female	08 (26.7)
Age, years (range)	38.1 (14-82)
Follow-up, months (range)	12.3 (1-36)

Table 2: Indications of PKP at Al-Ibrahim Eye Hospital

	No. of patients n (%)
Corneal scar	14 (64.7)
Keratoconus	9(30)
Pseudophakic bullous keratopathy	4(13.3)
Keratoglobus	1 (3.3)
Macular corneal dystrophy	1 (3.3)
Congenital hereditary endothelial dystrophy	1 (3.3)
Total	30 (100)

Table 3: Outcome by indications

Outcome	Keratoconus	Corneal scar	Pseudophakic bullous keratopathy	Other indications
Graft survival (number of clear grafts at final follow-up)	8 (88.9 %)	11 (78.6 %)	3 (75 %)	2 (66.7%)
Final best-corrected visual acuity				
20/40 or better	5 (55.6)	2 (14.3)	1 (25)	0 (0)
20/50 - 20 /150	3 (33.3)	4 (28.6)	2 (50)	1(33.3)
20/200 or worse	1 (11.1)	8 (57.1)	1 (25)	2 (66.7)

Final best-corrected visual acuity (after eliminating failed grafts) of 20/40 or better was achieved in 08 (33.3%) patients, 20/50 - 20/150 in 10 (41.7%) patients and 20/200 or worse in 06 (25%) patients. In keratoconus, 05 (55.6%) patients achieved final best-corrected visual acuity of 20/40 or better, followed by patients with corneal scar 02 (14.3%). In patients with pseudophakic bullous keratopathy, 01 (25%) patient achieved 20/40 or better vision. Outcome by indications is given in (Table 3).

Complications encountered in patients were: persistent epithelial defect in 04 (13.3%), bacterial keratitis in 04 (13.3%), endophthalmitis in 02 (6.7%), primary graft failure in 02 (6.7%), reversible graft rejection episodes in 02 (6.7%), retrocorneal membrane in 01 (3.3%) and wound dehiscence in 01 (3.3%) (Table 4).

Table 4: Complications of PKP at Al-Ibrahim Eye Hospital

Complication	Frequency n(%)
Persistent epithelial defect	4 (13.3)
Graft infection	4 (13.3)
Endophthalmitis	2 (6.7)
Primary graft failure	2(6.7)
Reversible graft rejection episodes	2 (6.7)
Retrocorneal membrane	1 (3.3)
Wound dehiscence	1 (3.3)

DISCUSSION

Penetrating keratoplasty (PKP) is an effective treatment for corneal diseases with poor vision. The outcome of PKP depends upon indications, operative techniques and postoperative care.

This study presents the results of 30 eyes of 30 patients who received corneal grafts at Al-Ibrahim Eye Hospital/Isra Postgraduate Institute of Ophthalmology, during 5 years period from January 2003 to December 2007.

Penetrating keratoplasty alone was performed in 70% patients and 30% patients had triple procedure in our series. This distribution of procedures is similar to

the data for Sweden⁶ and Kuwait⁷, where 71% and 66% of patients had PKP alone.

Comparing graft survival and final visual acuity between studies is difficult due to difference in population size and follow-up time. However; overall graft survival was 61% at the final follow-up (mean 12.3 months), compared with 64% at the last follow-up (mean 21.9 months) reported by Randleman JB⁸ and 76% at one year reported by Wiggins RE⁹.

Final best-corrected visual acuity (after eliminating failed grafts) of 20/40 or better was achieved in 33.3% patients, 20/50 - 20/150 in 41.7% patients and 20/200 or worse in 25% patients. Statistically, there is no significant difference on comparison with visual acuity reported in previous studies^{9, 10} using similar exclusion criteria. (P-value >0.05) Fig. 2.

Fig. 1: Graft Survival after PKP at Al-Ibrahim Eye Hospital

Fig. 2: Final visual acuity comparison among this study and wiggins⁸, vail⁹

Outcome of PKP in patients with keratoconus was good with 88.9% grafts remaining clear at final follow-up. Final best-corrected visual acuity of 20/40 or better was achieved in 55.6% patients. This is comparable to the study of Randleman JB⁸ who reported 87.5% clear grafts at final visit and final best-corrected visual acuity of 20/40 or better in 56.2% cases but lower than the figures reported by Lim L¹¹.

Although; the corneal scar was the leading indication in our series but the graft survival was less than keratoconus (78.6%) and 14.3% patients had final best-corrected visual acuity of 20/40 or better. Our results are better in comparison with Randleman JB⁸ who reported 66.7% clear grafts at final visit and final best-corrected visual acuity of 20/40 or better in 13.3% patients with corneal scar.

Pseudophakic bullous keratopathy (PBK) was with the least favorable outcome. Graft survival was 75% and 25% patients achieved final best-corrected visual acuity of 20/40 or better. These figures include visual acuity of failed grafts. Randleman JB⁸ reported 76.5% clear grafts at final follow-up and only 17.7% patients achieved final best-corrected visual acuity of 20/40 or better. Al - Marjan⁷ reported graft survival rate of 24%.

Penetrating keratoplasties are sometime beset by various complications. In our series, the rate of complications was highest in pseudophakic bullous keratopathy (PBK) group and lowest in keratoconus group. Regarding individual complications, persistent epithelial defect and bacterial keratitis were the most frequent complications encountered (13.3%). Persistent epithelial defect (epithelial defect for more than eight days) in our series is similar to the study of Shimazaki J¹² (12.0%). The postoperative defect in epithelial layer may occur because of loss of epithelium during donor cornea storage, intraoperative trauma, or any kind of minute trauma during postoperative period, tear film abnormalities, ocular surface disorders, or the effect of medication (especially with preservatives).

In our series, bacterial keratitis occurred more as compared to other studies¹³. This is probably related to suture related problems (loose/broken suture or exposed knots) because when a loose or broken suture is left unattended, it may lead to mucous accumulation and becomes nidus for the microorganisms. Siganos CS¹⁴ evaluated the presence of broken or loose suture and concluded that eroded sutures harbor bacteria and should be removed as early as possible. Most of the patients in our series

belonged to remote rural areas which lack the facilities of trained ophthalmologists.

The incidence of endophthalmitis was considerably high (6.7%) in our series as compared to figures for Kuwait⁷ and rest of the world¹⁵. These cases were reported after 6 months of the follow-up. High risk patients for PKP included eye rubbers and those who were unable to access eye care reliably¹⁶. Both of these cases shared above mentioned factors and had unsatisfactory compliance and poor follow-ups. Also they belonged to lower socioeconomic group with poor living conditions and inadequate hygiene.

Primary graft failure is a rare but major complication of PKP. In our series, 02 (6.7%) cases were observed in comparison with 21 (2.7%) cases reported by Mead MD¹⁷. This was probably related to poor quality of donor material.

Reversible graft (endothelial) rejection episodes were observed in 02 cases (6.7%). These occurred 9-11 months postoperatively and both grafts regained clarity after topical and systemic steroid treatment. Similar rates are reported by Kuchle M¹⁸ and Al - Marjan⁷. Other complications encountered were: wound dehiscence and inflammatory retrocorneal membrane which are also reported in literature.

This series showed that PKP is an effective procedure for the corneal disease with poor vision. Visual outcome was good especially in cases of keratoconus. Similar studies in future will help in developing better understanding about the outcome of PKP in developing countries especially in Pakistan.

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Fig. 1. Graft Survival after PKP at Al-Ibrahim Eye Hospital

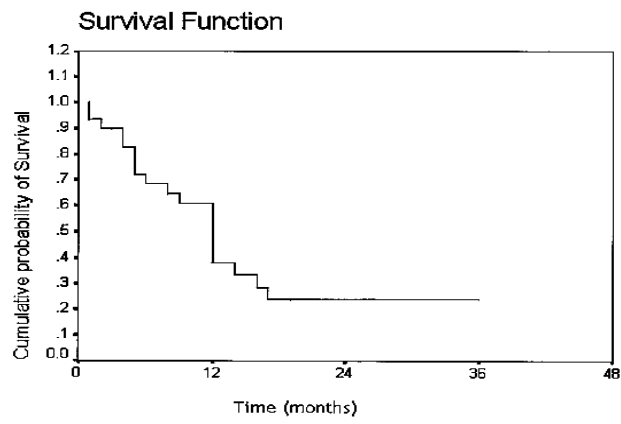


Fig. 2. Final visual acuity comparison among this study and wiggins⁸,vail⁹.

