



Short-Term Outcome of Penetrating Keratoplasty at a Tertiary Care Hospital

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Abstract

Objective: To study the short-term outcome of Penetrating keratoplasty (PKP) in terms of best corrected visual acuity (BCVA), Graft survival and Post operative complications.

Materials and Methods: 56-Consecutive cases undergoing PKP from January 2014 to September 2015 were included in the study. Out of which 28-cases had bullous keratopathy either pseudophakic or aphakic, 24 had corneal scar following trauma, acid injury or keratitis, 2-case had graft failure and 2 had anterior staphyloma. PKP was performed in 22-cases and 6-cases had triple procedure. Follow-up examinations were done at post-operative day-1, 1-week, 1-month, 3 months and at the completion of 6-months. BCVA, graft survival and complications were noted in every visit.

Results: Mean age of study group was 49.04 ± 10.2 year. Out of 56-cases underwent PKP 75% (42) were male and 25% (14) female. BCVA at final follow-up was: $\geq 6/60$ in 53.57% (30) cases, $5/60-1/60$ in 28.57% (16) cases and $\leq 1/60$ in 17.85% (10) cases. At 3-months Grade-IV graft clarity was present in 7.1% (4), grade-III in 46.42% (26), grade-II 28.57% (16), grade-I 17.85% (10) cases. Overall Graft survival was 82.14%. Persistent epithelial defects in 25% (14), secondary glaucoma in 14.2 % (8), Graft rejection 7.1%(4) and Primary graft failure 3.57%(2) are the common complications.

Discussion: PKP is an effective procedure for corneal disease with poor vision. In the present study visual outcome was good with most of the patients having BCVA $\geq 6/60$ and having grade-III graft clarity. The persistent epithelial defect was most common complication.

Keywords: Penetrating keratoplasty, Bullous keratopathy, Corneal scars.

Introduction

First successful human corneal transplantation using human donor was performed by Eduard Konrad Zirm in 1906¹, since then penetrating keratoplasty (PKP) has become one of the most popular and successful organ transplantation technique used worldwide. Penetrating

keratoplasty (PKP) involves surgical removal of diseased or damaged cornea and replacement with a full-thickness healthy donor cornea. Aim of PKP is to improve visual acuity and to maintain the integrity of the eye². In developing countries, corneal opacity is a common cause of ocular morbidity^{3,4}. Corneal transplantation has the

potential to reverse visual loss. Unfortunately, the potential of the procedure is limited by shortage of corneas, particularly in places where corneal disease is common, such as in many rural communities in developing countries⁵. The purpose of this study was to evaluate the outcome of PKP in term of visual acuity, graft survival and complications.

Method and Material

In this retrospective study data obtained by evaluating the case sheets of patients underwent PKP alone or triple procedure between Jan 2014 and September 2015. Information that was reviewed included patients age, sex, indication for PKP, type of surgery performed, preoperative and postoperative visual acuity, graft clarity, complications, and causes of postoperative decreased visual acuity. The type of procedure was defined as PKP alone and triple procedure (PKP combined with extracapsular cataract extraction and intraocular lens implantation). All cases included in the study were operated by a single surgeon. Each graft included in study had follow up on 1 week, 1 month, 3 month and 6 month. Best corrected visual acuity data were categorized as: >6/18, 6/18–6/60, 5/60–1/60, and less than 1/60. Graft clarity was graded as Grade 4 if grafts were optically clear with excellent view of iris details, Grade 2-3 (borderline) if there was moderate to significant corneal haze with or without good view of iris details, and Grade 1-0 for opaque grafts with poor view of iris and anterior segment details⁶. Graft survival was defined as number of clear grafts at final follow-up (6 months) and graft failure as number of grafts with irreversible loss of optical clarity.

Results

Out of 56 cases underwent PKP 75% (42) were male and 25% (14) were female. Mean age of study group was 49.04 year \pm 10.2 (25-72) years. PKP alone was performed in 44 cases and 12 cases underwent triple procedure. Surgical procedure was performed more on the right eye,

60.7% (34), as compared to the left eye 39.2% (22) [Table-1].

Table 1: Characteristics of patients underwent PKP

Characteristics	No. (%)
Total patients	56
Mean age(Range)	49.04 years \pm 10.2 (25- 72) years
Male	42 (75%)
Female	14 (25%)
Right eye	34 (60.71%)
Left eye	22 (39.28%)
PKP alone	44 (78.57%)
Triple procedure	12 (21.4%)

Indications for PKP in this study settings were bullous keratopathy either pseudophakic or aphakic, corneal scar following trauma or keratitis, corneal opacity due to chemical injury, anterior staphyloma and graft failure [Table-2]

Table-2 Indications of PKP

	Indications	No of cases (%)
1	Bullous keratopathy either aphakic or pseudophakic	28 (50)
2	Corneal scars secondary to	24 (42.8)
	2a Trauma	18(32.1)
	2b Keratitis	4(7.1)
	2c Chemical burn	2
3	Anterior staphyloma	2
4	Graft failure (Regraft)	2

Preoperative best-corrected visual acuity in all patients was 2/60 or worse. At 6 months follow-up, BCVA of >6/18 were obtained in 3.57% (2) patients, 6/18-6/60 found in 50% (28), 5/60-1/60 in 28.57% (16) patients and <1/60 in 17.85% (10) [Table-3]. In corneal scar due to trauma 12/18 (66.66%) patients achieved final best-corrected visual acuity of 6/60 or better followed by bullous keratopathy 16/28 (57.14%) patients and corneal scar due to infection 2/4 (50%) patients achieved 6/60 or better vision [Table- 4]. At 6 months overall Graft survival (graft clarity \geq 2plus) was 82.14% (46). The probability of survival at last follow-up among the bullous keratopathy grafts was 92.85% and in the corneal scar grafts was 75% [Table-4]. Grade IV graft clarity was present in 7.1% (4), grade III in 46.42% (26), grade II in 28.57% (16), grade I in 17.85% (10) cases. Causes of poor visual acuity in spite of clear graft were cataract (4), diabetic retinopathy (4) and glaucoma (8).

Table-3 Pre and post operative Best corrected visual acuity (BCVA)

BCVA	Pre operative	Post operative
>6/18	0	2
6/18-6/60	0	28
5/60-1/60	4	16
<1/60	52	10

Table-4 Best corrected visual acuity and graft clarity at 6 months of follow up

	Bullous keratopathy (28)	Corneal scar (24)			Anterior staphyloma (2)	Regraft (2)
		Trauma (18)	Keratitis (4)	Chemical burn (2)		
BCVA at 6 months Follow up						
>6/18	2	0	0	0	0	0
6/18-6/60	14	12	2	0	0	0
5/60-1/60	10	4	0	1	1	0
<1/60	2	2	2	1	1	2
No of clear graft	26	16	2	1	1	0

Complications reported in present were persistent epithelial defect 25%(14), secondary glaucoma 14.2%(8), graft rejection 7.1%(4), graft failure 3.5%(2) and Endophthalmitis 1.7%(1) [Table-5]

Table-5 Complications

Complications	No.	%
Persistent epithelial defect	14	25
Secondary glaucoma	8	14.28
Graft rejection	4	7.14
Primary graft failure	2	3.57
Endophthalmitis	1	1.7

Discussion

PKP is an effective treatment for poor vision due to corneal pathology. The outcome of PKP depends upon indications, operative techniques and postoperative care.

PKP alone was performed in 78.57% patients and 21.42% patients had triple procedure in present study. This distribution of procedures is more as compare to data of Sweden⁷ and Kuwait⁸, where 71% and 66% of patients had PKP alone.

In present study bullous keratopathy was the most common indication for PKP and accounted for 50% of all the cases followed by corneal scar due to trauma (32.14%). Sugar and Sugar⁹, Muraine et al.¹⁰ Dobbins et al¹¹, Cosar et al¹², Haaman et al¹³ and also reported that bullous keratopathy is a most common indication of PKP. Kanavi¹⁴ et al and Xie et al¹⁵ report corneal scar as the second most common indication in their study.

Bhatti et al¹⁶ reported corneal scar is the major indication followed by bullous keratopathy.

At 6 months follow-up, BCVA of >6/18 were recorded in 3.57% (2/56) patients, lower than other studies (6%-17%)^{18,19}, 53.5% (15/28) patients had BCVA \geq 6/60 which is nearly similar as reported by Doren GS et al²⁰(51%) and Rao SK et al²¹(50%). Over all graft survival was 82.14% at the last follow-up compared to 88.9% at the last follow-up reported by Chaidaroon and Lewsakul¹⁷, 82% reported by Rahman et al²², and 64% reported by Randleman et al.²³

In present study persistent epithelial defect (25%) and secondary glaucoma (14.85%) were the most frequent complications encountered. Persistent epithelial defect is more in present study as compared to the study of Shimazaki J²⁴ (12.0%) and Bhatti et al¹⁶ (13.3%). Loss of epithelium during donor cornea storage, intraoperative trauma or minute trauma during postoperative period, tear film abnormalities, ocular surface disorders, or the effect of medication are the probable causes. Secondary glaucoma in this study is present in 14.85% as compared to 11% noted by Thoft et al²⁵ and 23% by Goldberg et al²⁶. The probable cause of secondary glaucoma is aphakia, pre-existing glaucoma and post operative inflammation.

Primary Graft failure is a rare but important complication of PKP. In present study 2 (7.14%)

cases were observed in comparison to 21 (2.7%) cases reported by Mead et al²⁷ and 2 (6.7%) cases reported by Bhatti et al¹⁶. This was probably related to poor quality of donor material. Graft rejection was observed in two (7.14%) cases. Bhatti et al.¹⁶ reported 2 (6.7%) cases and similar rates are reported by Kuchle et al²⁸ and Al-Marjan et al²⁹.

A case of endophthalmitis (3.5%) was also reported in the study. Bhatti et al.¹⁶ (6.7%) reported high and Taban et al³⁰ (0.2%) reported low as compared to the present study. This case had unsatisfactory compliance and poor follow-ups. Also they belonged to lower socioeconomic group with poor living conditions and inadequate hygiene.

Conclusion

Penetrating keratoplasty is an important surgery to treat patients with corneal blindness. It is a relatively safe and reliable procedure. It remains the standard in treatment for full thickness corneal diseases despite newer advancements in surgery. The results of this study shows that penetrating keratoplasty helps patients in regaining vision which makes them able to move independently. Although in our study visual outcome of more than 6/60 was present only in little more than 50% cases. But this can improve further by proper selection of donors and recipients, patient education, Maintenance of good hygiene, proper instillation of medication and regular follow postoperatively.

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