



Indications and Outcomes of Repeat Keratoplasty for Graft Failure at a Tertiary Eye Care Center in Nepal

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ABSTRACT

Introduction: Graft failure is a common complication following keratoplasty requiring repeat keratoplasty (re-KP).

Objectives: To determine the indications and outcome of repeat keratoplasty at a tertiary eye care centre in Nepal.

Materials and methods: This was a retrospective study of 78 patients who underwent re-KP for graft failure in Tilganga Institute of Ophthalmology from Jan 2015 to Dec 2020. Indications for the primary keratoplasty, causes of graft failure and outcomes of re-KP in terms of vision acuity, graft clarity and secondary glaucoma were evaluated. Cases of re-graft with less than one-year follow-up period were excluded.

Results: A total of 78 re-KPs had been performed in 78 patients during the study period. Seventy eyes had undergone single corneal re-graft and 8 eyes had undergone multiple (second or third) re-graft surgery. Most common indication of primary keratoplasty was infectious keratitis (n=36; 46.2%). On follow up, 36 eyes (46.2%) were clear at the last visit, of which 31 eyes were single re-graft cases and 5 were of multiple re-graft cases. Most common cause of graft failure was graft infection (n=34; 43.6%) followed by corneal scarring (n=12; 15.4%). Of 42 eyes with failed re-grafts, recurrence of the preoperative infection was commonest cause (n=15, 35.7%) followed by secondary glaucoma (n=11; 26.2%). Of 36 eyes with clear re-graft, only 4 eyes (11.11%) achieved best corrected vision of $\geq 6/18$ and remaining 32 eyes had BCVA $< 6/18$ due to associated cataract, secondary glaucoma and high astigmatism.

Conclusion: The most common cause for re-KP includes graft infection followed by secondary glaucoma. Outcomes of corneal re-grafts in the form of graft clarity and visual acuity are suboptimal.

Key words: Graft failure, Keratoplasty, Re-graft.

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INTRODUCTION

Corneal pathology is one of the common causes of blindness; especially in developing countries (Maurin and Cornand, 1990). Corneal transplantation is the most successful tissue transplantation in humans. Despite advances in surgical techniques, immunosuppressives, antibiotics and antiglaucoma drugs, graft failure is common and remains one of the common indications for high-risk keratoplasty (Patel et al, 2000). Repeat keratoplasty (re-KP) has been reported to be the second leading indication for corneal transplantation in most large eye care centers with an average of 18% (range, 6% to 41%) (Zare et al, 2011). The primary indications for Re-KP varies from developing countries to developed countries. Most of the literatures have reported aphakic and pseudophakic bullous keratopathy as the common primary indications for corneal regrafts (Robinson, 1979; Insler and Pechous, 1986; MacEwen et al, 1988; Rapuano et al, 1990; Patel et al, 2000; Zare et al, 2011). However some studies found vascularized corneal scar as the most common primary indication for corneal regrant (Bersudsky et al, 2001; Vanathi et al, 2005). Graft failure is the third common indication for keratoplasty surgery in Tilganga Institute of Ophthalmology (TIO) (Bajracharya et al, 2013).

MATERIALS AND METHODS

We retrospectively reviewed records of 78 patients who were diagnosed as graft failure and underwent Re-KP during the period from January 2015 to December 2020 in TIO. Patients who lost to follow up less than one year were excluded.

The evaluated parameters were patient's age, gender, preoperative diagnosis, best corrected visual acuity (BCVA), indication and types (Penetrating Keratoplasty, Deep Anterior Lamellar Keratoplasty, Therapeutic Penetrating Keratoplasty) of primary corneal transplantation, indications and total number of regrafts, combined procedures performed and outcomes of corneal regrant like graft clarity, BCVA and Intraocular pressure (IOP).

Surgical technique varied according to the size, severity, and stromal depth of corneal lesions. All Donor cornea were provided by Nepal Eye Bank. Routine keratoplasty was performed with a graft diameter of 0.25 mm or 0.5 mm larger than the graft bed. The grafts were sutured with interrupted 10-0 nylon sutures. Lens extraction, anterior vitrectomy, intraocular lens (IOL) implantation, or IOL removal were done as necessary. Postoperatively patients were prescribed topical antibiotics, cycloplegics and steroid. Patients with resolved herpetic keratitis were given oral acyclovir 400 mg twice a day for at least three months. The follow up schedule after the surgery was daily from day one till epithelial healing, one week, one month, three months, six months, one year and yearly thereafter.

More than one corneal regrant was considered as a multiple regrant. Details of previous grafts in cases of multiple regrafts were collected from old records wherever available; however, only the latest corneal regrant was considered in outcome evaluation. Graft outcome was defined in terms of the clarity over a period of time till last follow-up or graft failure, whichever was earlier. Graft rejection was diagnosed by the

presence of endothelial or epithelial rejection line or both and corneal edema with anterior chamber reaction. Graft failure was diagnosed in cases with irreversible graft edema present with or without vascularization or scarring. Intraocular pressure greater than 21 mm Hg on two separate occasions was considered as secondary glaucoma.

Data were taken from electronic medical record and cleaned in MS Excel. All statistical analysis were done using SPSS version 20. For descriptive analysis, number, percentage, mean (SD) were calculated. For comparing normally distributed numerical data, independent t-test was used. p value <0.05 was considered as statistically significant.

This study followed the international norms and the tenets of the Declaration of Helsinki. Ethical approval was taken from the Institutional Review Committee of Tilganga institute of

ophthalmology. All the individual data of the study participants were kept confidential.

RESULTS

During the study period 78 eyes had undergone Re-KP. Demographic characteristics are tabulated in (Table 1). Majority of cases were between 40 to 60 years of age. Regraft was performed more in male than in female with ratio of 1:6:1. Majority of patient were from rural areas.

Primary keratoplasty was performed in all 78 cases in our institute. Most common indication of primary keratoplasty in corneal re-graft was infectious keratitis (48 of 78 eyes; 61.6%) (Table 2). Twelve out of 48 infectious keratitis were perforated corneal ulcers. The second commonest primary indication was corneal scar (19 of 78 eyes; 24.4%). Types of infectious keratitis are tabulated in (Table 3).

Table 1: Demographic characteristics of study participants

Characteristics		Frequency (percentage)
Patient number		78 (100)
Gender	Male	48 (61.5)
	Female	30 (38.5)
Age distribution (years)	<18	8 (10.26)
	18-40	18 (23.08)
	40-60	27 (34.61)
	>60	25 (32.05)
Laterality	OD	45 (57.7)
	OS	33 (42.3)
Address	Rural	39 (50.0)
	Urban	35 (44.9)
	India	4 (5.1)

Table 2: Indications of primary corneal transplantation in corneal regrafts

Indications	Frequency (percentage)
Infectious keratitis*	48 (61.6)
Corneal scar	19 (24.4)
Dystrophy	5 (6.4)
Keratoconus	1 (1.3)
Dermoid	1 (1.3)
Pseudophakic bullous keratopathy	1 (1.3)
Neurotrophic keratopathy	1 (1.3)
Others	2 (2.6)

*12 case were perforated corneal ulcers

Table 3: Types of infectious pathology as primary indications of keratoplasty

Frequency (Percentage)	Types
26 (54.2)	Fungal
10 (20.8)	Viral
7 (14.6)	Bacterial
4 (8.3)	Mixed
1 (2.1)	Acanthamoeba
48 (100)	Total

The most performed technique of primary corneal transplantation was penetrating keratoplasty (73 of 78 eyes; 93.6%). DALK was performed in 1 eye, DMEK in two eyes and lamellar grafts in two eyes. During the re-PK surgery, additional procedures were performed in 24 eyes. Of 24 eyes, cataract extraction with IOL implantation was performed in 20 eyes and anterior vitrectomy was done in 4 eyes.

Failure of primary graft was most commonly due to recurrence of infection (34 of 78 eyes; 43.6%) followed by corneal scarring (12 of 78 eyes; 15.4%). Others were attributable to primary graft edema in four eyes, graft rejection

in five eyes, secondary glaucoma in four eyes, late graft infection and perforation in four eyes and endothelial failure in remaining 15 eyes (19.2%).

Of 78 eyes, 36 grafts (46.2%) were clear at the end of follow up of which, 31 eyes were single regrant cases and five were cases of multiple regrafts. Failed regrafts in remaining 42 eyes (53.8%) were most commonly due to recurrent infection in 15 eyes (35.7%) followed by secondary glaucoma in 11 eyes. Other causes were graft rejection, perforation and phthisis bulbi.

**Table 4: Visual acuity of single versus multiple clear regrafts at last follow-up.**

Clear regrafts (n=36)	BCVA 6/18 or better	BCVA less than 6/18
Single regraft (n=31)	3 (9.7%)	28 (90.3%)
Multiple regraft (n=5)	1 (20.0%)	4 (80.0%)

Mean best corrected visual acuity (BCVA) log MAR among the eyes with clear grafts (36 of 78 eyes) was 1.27 ± 0.77 compared to 2.31 ± 0.51 among the eyes with failed grafts (42 of 78 eyes). The difference between the two groups was statistically significant, $p < 0.001$. BCVA of 6/18 or better was present in only 4 of 36 clear graft cases (11.11%). Remaining 32 cases had BCVA below 6/18 due associated cataract, secondary glaucoma, astigmatism and macular scars. Best corrected vision among clear grafts has been tabulated in (Table 4).

DISCUSSION

Corneal regrafts continue to be important and common clinical indication of penetrating keratoplasty despite advances in surgical techniques, immunosuppressives, antibiotics, antiglaucoma therapy and postoperative care. The rise in number of primary corneal transplantation has been followed by the rise in the regraft number especially in developing countries. Dandona et al reported corneal regraft as second most common indication of penetrating keratoplasty (17.1%) (Dandona et al, 1997). Bajracharya et al reported graft failure as third most common indications (11%) of keratoplasty in TIO.

Earlier studies have reported aphakic and pseudophakic bullous keratopathy as the common primary indications for corneal regrafts (Robinson, 1979; Insler and Pechous, 1986;

MacEwen et al, 1988; Rapuano et al, 1990; Patel et al, 2000; Zare et al, 2011). However Vanathi M et al (2005) in their study in India found vascularized corneal scar as the most common indication of primary keratoplasty. In our study, most common indication of primary keratoplasty in corneal regraft was infectious keratitis (48 of 78 eyes; 61.6%) followed by corneal scar (19 of 78 eyes; 24.4%). Fungal isolates were most common followed by viral keratitis. This is explained as our country is agriculture based developing country, the farmers and poor people work without protective measures and also present late with infectious keratitis along with complications requiring TPK.

Outcomes of corneal regrafts in the form of graft clarity and visual acuity have been reported to vary widely in the literatures. Previous studies have reported graft clarity percentage to vary from 51% to 74% (Cowden, Kaufman and Polack, 1974; Rapuano et al, 1990; Patel et al, 2000; Bersudsky et al, 2001). Similarly Vanathi et al (2005) in their study found graft clarity of 52.8%. In our study outcome of corneal regraft in the form of graft clarity percentage was almost comparable 46.2%. Failed regrafts in remaining 53.8% of cases were most commonly due to recurrence of infection (35.7%). our institute is tertiary eye care referral center of the country, which perform large number of therapeutic keratoplasties for refractory or perforated infective keratitis. In fact,

therapeutic keratoplasty constitutes 45% of all keratoplasty performed in our institute and is the most common indication for keratoplasty in our institute as reported by Bajracharya L et al (2013). The recurrence rate of preoperative infection in TPK in our institute has been 11.1% and graft failure rate of 62.8%. This would explain the reason why the most common primary indication for graft failure in our study has been infective keratitis. Secondary glaucoma was the second most common cause of failed re-grafts (26.2%) in this study which is comparable to 20% reported by Vanathi M et al (2005).

Visual outcome of corneal re-grafts remains another important issue. Graft survival and visual outcomes have been reported to decrease with the number of re-grafts. Previous studies have reported visual acuity of 20/40 or better in 15% to 41% of clear re-grafts (Rapuano et al, 1990; Patel et al, 2000; Bersudsky et al, 2001).

In our study, BCVA of 6/18 or better was present in only in 11.11% of clear grafts and remaining 88.89% of clear grafts had BCVA of <6/18 mainly due to associated cataract, secondary glaucoma and astigmatism.

CONCLUSION

Graft infection is leading cause of repeat penetrating keratoplasty in our country. Though outcomes corneal re-grafts in the form of graft clarity and visual outcome remain suboptimal, repeat penetrating keratoplasty should be considered depending on the need of patient. This also emphasizes on the importance of proper postoperative care, counselling and other preventive measures to reduce the number of graft infection and graft failure requiring re-grafts.



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