



Effect of Keratoconus Severity on Clinical Outcomes after Deep Anterior Lamellar Keratoplasty

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Abstract

Background: *Keratoconus is a non-inflammatory disorder characterized by ectasia of the cornea, most commonly the central or inferior portion of the cornea, with eventual progressive protrusion and corneal thinning. To evaluate the effect of keratoconus severity on the visual and refractive outcomes after deep anterior lamellar keratoplasty (DALK).*

Methods: *This study enrolled 30 keratoconus-affected eyes that underwent DALK. The outcome measures, including postoperative best spectacle-corrected visual acuity (BSCVA), spherical equivalent refraction, keratometric astigmatism, were analyzed.*

Results: *Mean age of the patients was 21.25±8.6 years with the age range of 13 years to 31 years. Out of the 30 patients, 21 were males and 9 were females. DALK was done in 14 patients in the right eye and 16 patients in the left eye. Pre-operatively corneal apical scar was seen in all cases. A 0.2mm larger graft was used in all patients. The mean refractive astigmatism preoperatively was -3.5D which changed to 0.40D, 0.86D, 0.33D at 1 month, 3 month, and 6 months postoperatively, respectively. The mean Snellen LogMAR BCVA was 1.14 + 0.38, 0.77 ± 0.26, 0.64 ± 0.29, and 0.60 ± 0.30 at baseline, 1 month, 3 months, and 6 months respectively.*

Conclusion: *DALK is a safe and effective procedure for the treatment of keratoconus.*

Keywords: *DALK, Refractive error, Cornea.*

Introduction

Keratoconus is a non-inflammatory disorder characterized by ectasia of the cornea, most commonly the central or inferior portion of the cornea, with eventual progressive protrusion and corneal thinning.

The cornea, a clear transparent structure, is the major refractive surface of the eye. The corneal

thinning and protrusion in keratoconus induces irregular astigmatism and myopia causing mild to marked visual impairment. The prevalence of Keratoconus is about 50 to 230 per 100,000 population.¹

Keratoconus usually has its onset at puberty and progresses until third to fourth decade of life when it usually arrests. Keratoconus is reported to have

bilateral involvement in over 90 percent of patients, with asymmetric presentation. It usually affect one eye more than the other, with keratoconus becoming apparent in fellow eye after many years.² The term “forme fruste keratoconus” is used for less affected fellow eye, where there are certain topographic changes with no clinical findings.

Materials and Methods

Design: This is a hospital based prospective study.

Inclusion Criteria

Moderate (46D - less than 55D) to severe (>55 D) keratoconus with

1. Poor spectacle corrected visual acuity
2. Intolerance to Rigid gas permeable contact lens
3. Inappropriate contact lens fit.

Exclusion Criteria

- 1) Coexistence of other corneal pathologies (hydrops, stromal opacification, Descemet’s tear, cataract, retinal disorder, glaucoma)
- 2) Patients not willing to participate in the study, and those who did not adhere to the recommended follow up.

Diagnosis of the disease was based on

- 1) Careful history,
- 2) Slit lamp examination showing signs of keratoconus like corneal ectasia, stromal thinning, Fleischer ring, Vogt striae.
- 3) Manual keratometry values and confirmed by corneal topography.

Postoperative management and follow up

Medications

Corticosteroids: Topical 1 percent prednisolone acetate four times a day was used post surgically. According to the patient’s response the steroid dose was tapered.

Antibiotics: Topical broad spectrum antibiotics like gatifloxacin or moxifloxacin were used four times a day for three to six months.

Lubricants: Preservative free lubrication was used for at least a month following keratoplasty. It aides in the re-epithelization.

Suture Removal: Sutures were removed if it was infected or loosened or broken or causing vascularisation. It was also indicated when it was causing high or irregular astigmatism.

Follow up

Patients were admitted for at least three to five days after the procedure when the epithelisation was occurring and the corneal edema was settling down. Thereafter patient was reviewed after a month, again at 3 months and then at 6 months post-operatively. At every visit careful slit lamp examination and refraction was done.

Statistical Methods

Mean (SD) and Frequency (percentage) was used for continuous and categorical variables respectively. Fisher’s exact test or chi-square test was used to assess the difference between the categorical variable. Student t-test or Mann-Whitney U test was used to test mean difference between the two continuous variables. P-value of less than 0.05 considered as statistically significant.

Observations and Results

A total of 30 eyes of 30 patients were included in the study as per study protocol to analyze the outcomes of deep anterior lamellar keratoplasty. Mean age of the patients was 21.25 ± 8.6 years with the age range of 13 years to 31years. Out of the 30 patients, 21 were male and 9 were female. DALK was done in 14 patients in the right eye and 16 patients in the left eye. Preoperatively corneal apical scar was seen in all cases. A 0.2mm larger graft was used in all patients.

Table 1: Spherical equivalent

Spherical equivalent	Base line	After 6 months follow-up	p-value
Mean	-16.32	0.001	<0.01
SD	-2.5	3.05	

Postoperatively at 6 months, SE was 0.001 ± 3.05 .

Table 2: Refractive astigmatism

Refractive astigmatism	Mean	SD
Base line	-3.5 D	0.94 D
1 months	0.40 D	3.65 D
3 months	0.86 D	3.56 D
6 months	0.33D	2.25 D

The mean refractive astigmatism preoperatively was -3.5D which changed to 0.40D, 0.86D, 0.33D at 1 month, 3 month, and 6 months postoperatively respectively.

Table 3: Intraocular pressure

Intraocular pressure (mm of Hg)	Mean	SD
Base line	12	3.01
1 months	19.07	5.99
3 months	18.92	8.07
6 months	16.42	4.23

The mean baseline IOP was 12 mm of Hg and 16.46 mm of Hg at 6 months postoperatively.

Table 4: Visual acuity

Visual acuity	Mean	SD
Base line	1.14	0.38
1 months	0.77	0.26
3 months	0.64	0.29
6 months	0.60	0.30

Visual acuity was recorded by Snellen's chart for all the patients on all visits. For the ease of comparison visual acuity was converted to Log MAR Snellen VA. The mean Snellen Log MAR BCVA was 1.14 ± 0.38 , 0.77 ± 0.26 , 0.64 ± 0.29 , and 0.60 ± 0.30 at baseline, 1 month, 3 months, and 6 months respectively.

Table 5: Visual outcome

BCVA at 6months	No of eye	Percentage
6/6-6/18	14	46.67
6/24-6/60	12	40.00
5/60-3/60	4	13.33
<3/60	0	0.00
Total	30	100.00

Visual outcome at the end of 6 months showed that 14 patients had BCVA of 6/6 – 6/18, 12 patients had BCVA of 6/24 – 6/60 and 4 patients had BCVA in the range of 5/60 – 3/60.

Discussion

Keratoconus, a progressive non inflammatory ectatic disorder of the cornea, mainly has its onset

during puberty and progresses during second to third decade of life. Keratoconus causes visual morbidity in young people. The refractive error caused by the ectasia of the cornea is usually successfully treated with contact lenses. While RGP contact lenses remain the contact lenses of choice, the newer contact lens design for keratoconus like Rose K lens, hybrid contact lens have improved the compliance of the patient for contact lens. Newer treatment modalities for keratoconus like corneal collagen cross linkage, intracorneal ring segments, phakic intraocular lens implantation, help to stabilize the vision and delay the need for keratoplasty surgery.

However around 10-20% of the keratoconus patients eventually progress and require keratoplasty surgery for reasons like poor visual acuity due to scarring of corneal stroma in visual axis, contact lens intolerance or poor visual acuity even after contact lens correction. Keratoplasty generally carries a good prognosis in keratoconus patients with good recovery of vision.

Penetrating keratoplasty is the well established and long time followed surgical treatment option for keratoconus. However deep anterior lamellar keratoplasty is more preferred now by many surgeons instead of full thickness penetrating keratoplasty.

A recent study by Kasbekar S et al,³ retrospective multicenter Cohort study, found a greater proportion of patients achieved 6/6 or better Snellen visual acuity following PKP than DALK, but no difference between the two groups was noted for the proportion of BCVA of 6/60 or less.

DALK have shown visual outcome of 95% eyes achieving BCVA of 6/6 postoperatively.^{4,5}

In a study conducted by Funnel et al⁴, 22% of patients undergoing DALK achieving BCVA of 6/6 postoperatively at the end of 1 year after surgery.

Conclusion

DALK is a safe and effective procedure for the treatment of all stages of keratoconus.

References

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