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ORIGINAL RESEARCH

Evaluation of visual recovery following descemet's membrane endothelial keratoplasty in Fuchs' dystrophy

[1]Pallavi Kumari, [2]Irfanur Rahman, [3]Abhishek Ranjan, [4]Pradeep Karak

[1,2]Senior Resident, [3]Assistant Professor, [4]Associate Professor and Head, Department of Ophthalmology, NMCH, Patna, Bihar, India

Corresponding author
Abhishek Ranjan
Assistant Professor, Department of Ophthalmology, NMCH, Patna, Bihar, India

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ABSTRACT

Background: In developed nations, the primary reason for corneal transplants is Fuchs' endothelial corneal dystrophy (FECD). The present study was conducted to evaluate visual recovery following descemet's membrane endothelial keratoplasty in Fuchs' dystrophy. **Materials & Methods:** 50 patients with Fuchs' endothelial corneal dystrophy (FECD) of both genderswere assessed prior to and at regular intervals over the 24 months following DSEK. During each visit, a slit-lamp examination was used to assess graft survival; the measurement of best spectacle-corrected visual acuity (BSCVA) was carried out. **Results:** Out of 50 patients, 30 were males and 20 were females. Before surgery, at 6 months, 12 months and at 24 months, visual and optical function (logMAR) at high contrastBSCVA was 0.45, 0.22, 0.18 and 0.14, UCVA was 0.70, 0.45, 0.40 and 0.41, at low contrast photopicwas 0.89, 0.60, 0.55 and 0.52, at mesopic was 1.05, 0.93, 0.88 and 0.87 respectively. Forward scatter (log straylight parameter) was 1.55, 1.35, 1.37 and 1.31. Total HOAs, RMS at 4 mm was 0.29, 0.28, 0.29 and 0.27 and at 6 mm was 0.70, 0.70, 0.68 and 0.65. Keratometric cylinder (D) was 0.40, 1.20, 1.19 and 1.20, anatomic function, corneal thickness (mm) on ultrasound was 656, 681, 679 and 678 and on confocal was 612, 660, 660 and 664 respectively.Graft thickness was 154mm, 159 mm, 158 mm and 153 mm. Backscatter (SUs) anterior was 2034, 1741, 1863 and 1727 and interface was 1320, 1272 and 1178. Endothelial cell density (cells/mm2) was 2925, 2166, 2009 and 1837. Endothelial cell loss (%) was 0, 7, 32 and 38 respectively. The difference was significant (< 0.05). **Conclusion:** The enhancement of vision coincides with a persistent decrease in corneal haze and aberrations, indicating that corneal remodeling continues after the restoration of endothelial function.

Keywords: Best spectacle-corrected visual acuity, Fuchs' endothelial corneal dystrophy, visual and optical function

INTRODUCTION

In developed nations, the primary reason for corneal transplants is Fuchs' endothelial corneal dystrophy (FECD). Descemet's stripping automated endothelial keratoplasty (DSAEK) is the most commonly performed corneal transplantation method, offering faster healing, earlier visual recovery, and more predictable refractive outcomes compared to penetrating keratoplasty (PK).[1] Nonetheless, best-corrected visual acuity (BCVA) is rarely completely restored, and DSAEK does not appear to offer better BCVA than PK.[2]

The visual function of DSAEK can be restricted by corneal pathology affecting either the anterior or posterior layers.[3] Research on what influences vision post-DSAEK does not present a consensus. Post-DSAEK vision is associated with anterior higher-order aberrations (HOAs), overall corneal scatter, and graft thickness. A recent review determined that the reason for limited visual outcome after DSAEK is still uncertain.[4]

Although best-corrected visual acuity (BCVA) is a key outcome following DSAEK, it does not always correlate with enhanced patient-reported outcomes. As an example, reports indicate that contrast sensitivity (CS) is a better indicator of enhancements in perceived visual quality.[5,6]The present study was conducted to evaluate visual recovery following descemet'smembrane endothelial keratoplasty in Fuchs' dystrophy.

MATERIALS & METHODS

The study was carried out on 50 patients with Fuchs' endothelial corneal dystrophy (FECD) of both genders. All gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. Subjects were assessed prior to and at regular

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intervals over the 24 months following DSEK. During each visit, a slit-lamp examination was used to assess graft survival; the measurement of best spectacle-corrected visual acuity (BSCVA) was carried out with the electronic Early Treatment Diabetic Retinopathy Study (ETDRS) protocol; total anterior corneal higher-order aberrations (HOAs) were calculated based on corneal topography; and corneal backscatter, thickness, and endothelial cell density were evaluated using confocal microscopy images. Ultrasonic pachymetry was used to measure corneal thickness as well. Changes following DSEK were examined with generalized estimating equation models.Results thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Total- 50		
Gender	**Male**	**Female**
Number	30	20

Table I, graph I shows that out of 50 patients, 30 were males and 20 were females.

Graph I Distribution of patients

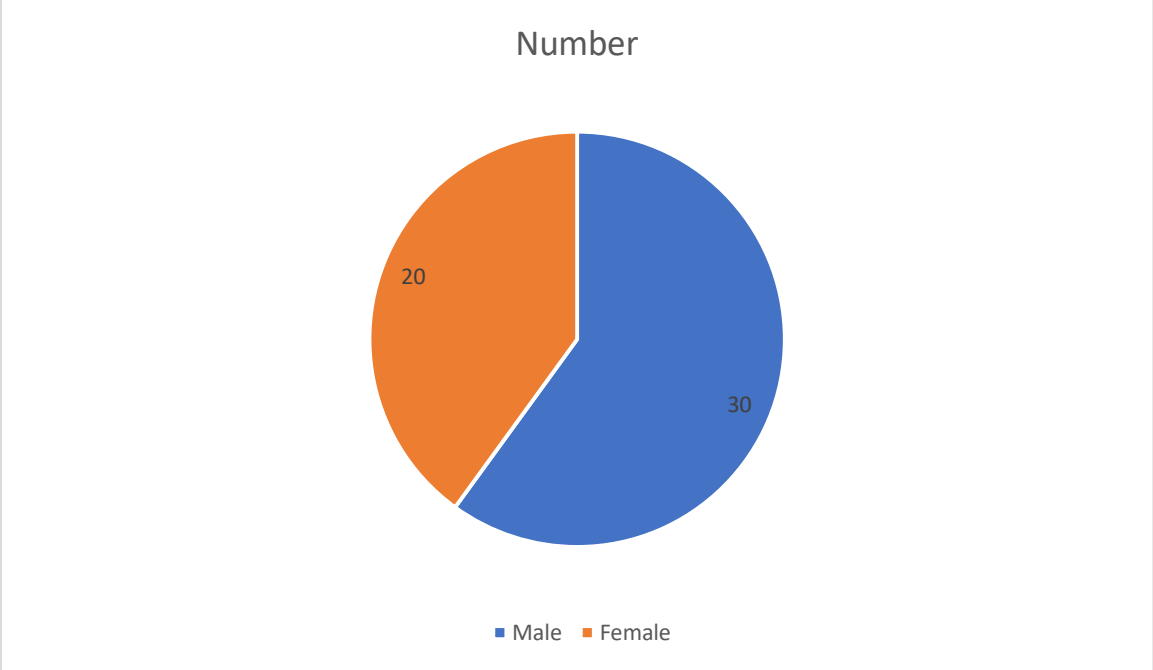

Table II Assessment of parameters

Parameters	Variables	Before Surgery	6 months	12 months	24 months	P value
Visual and optical function (logMAR) at High contrast	BSCVA	0.45	0.22	0.18	0.14	0.05
	UCVA	0.70	0.45	0.40	0.41	0.02
Low contrast	Photopic	0.89	0.60	0.55	0.52	0.03
	Mesopic	1.05	0.93	0.88	0.87	0.05
Forward scatter(log stray light parameter)		1.55	1.35	1.37	1.31	0.02
Total HOAs, RMS(mm)	4mm	0.29	0.28	0.29	0.27	0.11
	6mm	0.70	0.70	0.68	0.65	0.92
Keratometric cylinder(D)		0.40	1.20	1.19	1.20	0.46
Anatomic function Corneal thickness(mm)	Ultrasound	656	681	679	678	0.92
	Confocal	612	660	660	664	0.94
Graft thickness(mm)		154	159	158	153	0.83
Back scatter(SUs)	Anterior	2034	1741	1863	1727	0.04
	Interface	–	1320	1272	1178	0.05
Endothelial cell density(cells/mm^2)		2925	2166	2009	1837	0.14
Endothelial cell loss(%)		–	27	32	38	

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Table II shows that before surgery, at 6 months, 12 months and at 24 months, visual and optical function (logMAR) at high contrast BSCVA was 0.45, 0.22, 0.18 and 0.14, UCVA was 0.70, 0.45, 0.40 and 0.41, at low contrast photopic was 0.89, 0.60, 0.55 and 0.52, at mesopic was 1.05, 0.93, 0.88 and 0.87 respectively. Forward scatter (log straylight parameter) was 1.55, 1.35, 1.37 and 1.31. Total HOAs, RMS at 4 mm was 0.29, 0.28, 0.29 and 0.27 and at 6 mm was 0.70, 0.70, 0.68 and 0.65. Keratometric cylinder (D) was 0.40, 1.20, 1.19 and 1.20, anatomic function, corneal thickness (mm) on ultrasound was 656, 681, 679 and 678 and on confocal was 612, 660, 660 and 664 respectively.Graft thickness was 154 mm, 159 mm, 158 mm and 153 mm. Backscatter (SUs) anterior was 2034, 1741, 1863 and 1727 and interface was 1320, 1272 and 1178. Endothelial cell density (cells/mm2) was 2925, 2166, 2009 and 1837. Endothelial cell loss (%) was 0, 7, 32 and 38 respectively. The difference was significant (< 0.05).

DISCUSSION

The preferred method of treatment for Fuchs' endothelial corneal dystrophy (FECD) has become endothelial keratoplasty, which is also the leading reason for this procedure in the United States.[7] Descemet stripping endothelial keratoplasty (DSEK) involves the removal of the host's abnormal Descemet membrane and endothelium, which are then substituted with donor tissues comprising Descemet membrane and endothelium, along with a donor corneal stroma of variable thickness.[8] Visual function and quality of life enhance rapidly post-DSEK, and the 3- and 5-year graft survival rates for Fuchs' dystrophy are similar to those following penetrating keratoplasty (PK).[9]The present study was conducted to evaluate visual recovery following descemet'smembrane endothelial keratoplasty in Fuchs' dystrophy.

We found that out of 50 patients, 30 were males and 20 were females. Nielson et al[10]investigated the determining factors of vision and subjective outcome after Descemet's stripping automated endothelial keratoplasty (DSAEK) for Fuchs' endothelial dystrophy (FECD). 41 FECD patients who received DSAEK were compared to 40 cataract patients with normal corneas who received cataract surgery (control group). Best-corrected visual acuity (BCVA) negatively correlated with anterior higher-order aberrations (HOA's) ($p < 0.001$) and central corneal thickness ($p = 0.001$). Contrast sensitivity (CS) was negatively correlated with anterior HOA's ($p = 0.002$) and positively correlated with posterior densitometry ($p = 0.008$). Catquest-9SF effect size was 1.32 (CI: 1.0–1.6) in the control group, 1.84 (CI: 1.4–2.3) in FECD patients who received phacoemulsification and intraocular lens implantation in combination with DSAEK (n = 26) and 1.37 (CI: 0.6– 2.1) in pseudophakic FECD patients who received DSAEK (n = 15).

We found that before surgery, at 6 months, 12 months and at 24 months, visual and optical function (logMAR) at high contrastBSCVA was 0.45, 0.22, 0.18 and 0.14, UCVA was 0.70, 0.45, 0.40 and 0.41, at low contrast photopic was 0.89, 0.60, 0.55 and 0.52, at mesopic was 1.05, 0.93, 0.88 and 0.87 respectively. Forward scatter (log straylight parameter) was 1.55, 1.35, 1.37 and 1.31. Total HOAs, RMS at 4 mm was 0.29, 0.28, 0.29 and 0.27 and at 6 mm was 0.70, 0.70, 0.68 and 0.65. Keratometric cylinder (D) was 0.40, 1.20, 1.19 and 1.20, anatomic function, corneal thickness (mm) on ultrasound was 656, 681, 679 and 678 and on confocal was 612, 660, 660 and 664 respectively.Graft thickness was 154 mm, 159 mm, 158 mm and 153 mm. Backscatter (SUs) anterior was 2034, 1741, 1863 and 1727 and interface was 1320, 1272 and 1178. Endothelial cell density (cells/mm2) was 2925, 2166, 2009 and 1837. Endothelial cell loss (%) was 0, 7, 32 and 38 respectively. The difference was significant (< 0.05). Wacker et al[11]determined 5-year outcomes of Descemet stripping endothelial keratoplasty (DSEK) for Fuchs' endothelial corneal dystrophy (FECD). Complete 60-month follow-up was possible in 34 eyes. Mean BSCVAstandard deviation improved from 0.45±0.19 logarithm of the minimum angle of resolution (logMAR) (Snellen equivalent, 20/56) before DSEK to 0.09±0.13 logMAR (Snellen equivalent, 20/25) at 5 years ($P < 0.001$). Between 1 and 5 years, BSCVA improved by 0.06 logMAR (or 3 ETDRS letters; 95% confidence interval, 0.05e0.07 logMAR) per year ($P< 0.001$), and 56% of eyes were 0.1 logMAR (20/25) or better at 5 years. Graft thickness (approximately 155 mm) and corneal thickness (approximately 700 mm) did not change after surgery. Anterior corneal HOAs and backscatter decreased between 1 and 5 years (P- 0.002). Six grafts failed, of which 4 were primary (iatrogenic); mean endothelial cell loss±standard deviation was 55±15% at 5 years

Gauthieret al[12] in their study 35 eyes of 32 patients with Fuchs endothelial dystrophy who underwent surgery by DMEK were included. Measurement at D10, M1, M3, M6 of visual acuity, graft endothelial cell density, pachymetry, and intraocular pressure, and performance at M6 of aberrometry, macular OCT and a qualityof life survey (NEI-VFQ-25). Post-DMEK aberrations are compared to those from control patients selected for refractive surgery. Visual acuity improvement at 6 months was statistically significant ($P < 0.0001$), as well as pachymetry decrease ($P < 0.0001$), endothelial cell loss ($P < 0.0001$) and intraocular pressure increase ($P = 0.003$). They observed a statistically significant difference between post-DMEK aberrations and those of control subjects for all aberrations from 2nd to 5th order. There were no postoperative correlations between visual acuity, pachymetry, intraocular pressure, or endothelial cell

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loss. The global quality of life score at six months was 87, corresponding to a good quality of life. We did not find a link between the global NEI-VFQ-25 score and visual acuity or visual aberrations. Ninety percent of patients surveyed reported a postoperative general improvement in quality of life at M6.
The shortcoming of the study is small sample size.

CONCLUSION

Authors found that the enhancement of vision coincides with a persistent decrease in corneal haze and aberrations, indicating that corneal remodeling continues after the restoration of endothelial function.

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