Int Ophthalmol (2012) 32:571–575
DOI 10.1007/s10792-012-9615-4

ORIGINAL PAPER

Clinical outcomes of non-Descemet stripping automated endothelial keratoplasty

Sunita Chaurasia · Muralidhar Ramappa · Virender S. Sangwan

Received: 22 February 2012 / Accepted: 16 July 2012 / Published online: 31 July 2012

Abstract To describe the results of non-Descemet stripping automated endothelial keratoplasty (non-DSAEK). Retrospective, interventional, consecutive clinical case series. Twenty-three patients underwent non-DSAEK from January 2010 to February 2011. The various indications were pseudophakic corneal edema, aphakic corneal edema, failed graft, iridocorneal endothelial syndrome and congenital glaucoma. Corneal edema cleared in all patients within 1–4 weeks. Mean follow-up duration was 7.6 months. Post-operative best corrected visual acuity ranged from 20/400 to 20/40. Fourteen patients had co-morbid factors affecting the vision. No patient had interface haze. Immediate post-operative complications were partial graft detachment (1 patient) and secondary angle closure (1 patient). Corneal clarity was restored following secondary interventions. One late post-operative complication was graft rejection at 6 months, leading to graft failure. Non-DSAEK is a safe and viable option in cases of corneal decompensation when the Descemet membrane is non-pathological.

S. Chaurasia (✉) · M. Ramappa · V. S. Sangwan
Cornea and Anterior Segment Services, LV Prasad Eye Institute, Kallam Anji Reddy Campus, L.V. Prasad Marg, Banjara Hills, Hyderabad 500 034, India
e-mail: sunita@lvpei.org

Keywords Descemet membrane · Endothelial keratoplasty · Descemet stripping endothelial keratoplasty

Introduction

Endothelial keratoplasty (EK) is the procedure of choice for endothelial disorders. Conventionally, the procedure is performed by stripping off the Descemet membrane (DM) and transplanting a posterior lamellar graft. However, it is increasingly realized that Descemet membrane removal may be an avoidable surgical step in patients with endothelial failure and where the Descemet membrane is normal [1–4].

In this study, we report our clinical observations in 23 patients where endothelial keratoplasty was performed without removal of the Descemet membrane for various indications.

Methods

This was a retrospective analysis of 23 consecutive patients who underwent endothelial keratoplasty without Descemet membrane stripping from January 2010 to February 2011. The decision to avoid DM stripping was based on pre-operative slit lamp examination and intra-operative evaluation. Inclusion criteria for

non-Descemet stripping endothelial keratoplasty were patients in whom the Descemet membrane was expected to be normal and optically clear. In patients with primary endothelial dysfunction, such as Fuchs' endothelial dystrophy, Descemet membrane stripping was always performed as these eyes are known to have guttata, which would potentially affect the visual outcome by causing scattering of light [5]. Fuchs' endothelial dystrophy was ruled out by clinical examination and confocal microscopy of the contralateral eye whenever possible.

In this paper, demographics, indications, surgical intervention, clinical findings, and outcomes after non-Descemet stripping endothelial keratoplasty are reviewed.

Surgical techniques

All patients underwent surgery under local anesthesia. The donor cornea was prepared first, followed by surgery on the recipient. The donor cornea dissection was performed using a Moria ALTK microkeratome (Moria/Microtek Inc., Doylestown, Pennsylvania, USA) equipped with a 350 μm microkeratome head. After lamellar dissection, the donor tissue was then transferred onto a Teflon block and 8.0–8.5 mm trephination was performed.

The host corneal epithelium was debrided to enhance anterior chamber visualization. A 4–5 mm size superior or temporal sclera/limbal incision was made. The posterior lamellar graft was inserted by the push-in technique using Sheet's IOL glide (BD Medical–Ophthalmic Systems) protecting the endothelium with sodium hyaluronate 1 % (Healon, Abbot Medical Optics, Inc, Illinois, USA). Following insertion, the graft was positioned using full-chamber air tamponade. The side port incisions and scleral tunnel incisions were sutured using 10-0 nylon interrupted sutures wherever necessary. Post-operative supine positioning was maintained for 15–30 min. In patients with glaucoma, partial evacuation of air was performed after half an hour in the supine position.

Post-operative evaluation was performed at regular intervals and included assessment of best corrected visual acuity (BCVA), slit lamp examination, tonometry and confocal microscopy (Nidek, Confoscan 4), whenever possible. All patients received topical broad spectrum antibiotic drops for the first 1–2 weeks and Prednisolone acetate 1 % (Alcon Labs, Fort Worth, Texas) in tapering doses over several months with maintenance of at least twice daily dosage after 4 months.

Results

The mean age of the patients was 53.7 years (range 13–79 years). Eight (34.7 %) were females and 15 (65.2 %) were males. The indications for endothelial keratoplasty were pseudophakic corneal edema (13 patients; 56.5 %), aphakic corneal edema (2 patients; 8.6 %), failed graft (5 patients; 21.7 %), iridocorneal endothelial (ICE) syndrome (2 patients; 8.6 %), and congenital glaucoma (1 patient; 4.3 %). Four patients had undergone glaucoma filtering surgery and 3 had received prior vitreoretinal intervention in the past. The mean duration between the primary cataract surgery and endothelial keratoplasty was 7.2 years (range 2–15 years). Table 1 summarizes the demographics and the pre-operative and post-operative clinical data.

Corneal edema cleared in all patients. The duration of resolution of corneal edema ranged from 1 to 4 weeks. The graft–host interface noted on the first post-operative day was observed to become gradually less conspicuous with the resolution of corneal edema. Figure 1a, b shows a representative slit lamp photograph. The mean follow-up period was 7.6 months (range 3–18 months).

The pre-operative visual acuity was <20/400 in all patients. Post-operative visual acuity was 20/40 or better in 9/23 eyes (39.1 %), 20/60 to 20/40 in 4/23 eyes (17.3 %), 20/100 to 20/60 in 4/23 eyes (17.3 %), and <20/200 in 6/23 eyes (26 %). Fourteen eyes had co-morbid pathologies affecting visual acuity.

The immediate post-operative complications seen on post-operative day 1 were partial graft detachment in 1 patient and raised intraocular pressure due to secondary angle closure in another patient. Rebubbling procedure was performed for the detached graft with successful restoration of graft reattachment and corneal clarity. In the other patient, peripheral anterior synechiolysis was performed to relieve the secondary angle closure. This patient was pseudophakic with a floppy iris probably due to previous surgical trauma. Secondary angle closure occurred due to air migration behind the iris and peripheral iridocorneal contact, and was not relieved even on assuming a supine position.

Table 1 Clinical and surgical information

Case no.	Age/ gender	Indication	Eye	Additional procedures	Pre-op vision	Post-op events (duration)	Secondary intervention	Graft clarity Y/N	BCVA	Co-morbid condition affecting vision	Last follow up (months)
1	60/f	PBK	OS	IOL explantation + membranectomy + AV	CFCF			Y	20/40		12
2	31/f	PBK	OS	IOL explantation + AV	HM			Y	20/40		12
3	35/f	Failed TPK	OD	Phaco + PCIOL	CFCF	Rejection (at 6 months)		Y	20/60		6
4	35/f	ICE syndrome, s/p GFS	OS	–	HM, PR inaccurate			Y	20/40		6
5	58/f	PBK	OS	–	CFCF			Y	20/25		18
6	65/m	PBK s/p GFS	OS	–	HM, PR inaccurate			Y	20/ 400	Advanced disc damage	3
7	55/m	ICE syndrome, Chandler's variant	OS	–	CFCF			Y	20/20		12
8	50/m	Failed TPK	OS	Phaco + AV + PCIOL	CFCF			Y	20/40		12
9	65/f	Failed optical PK	OD	–	HM			Y	HM	Extensive chorioretinal degeneration	3
10	13/f	Congenital glaucoma, s/p GFS	OS	–	CFCF, PR inaccurate			Y	20/ 100	Glaucomatous disc, amblyopia	6
11	68/m	PBK, s/p PPV + sfIOL	OS	–	CFCF	Partial detachment with AC communication (on Day 1)	Rebubbling	Y	20/ 100	Macular changes	9
12	58/m	Failed optical PK s/p GFS	OD	–	CFCF			Y	20/50	Advanced glaucomatous disc	3
13	79/m	Failed optical PK, s/p ASP	OD	–	HM			Y	20/ 400	Subepithelial haze, post ASP	7
14	65/m	ABK	OD	AV + PI + ACIOL	HM			Y	20/ 400	Disc pallor	12
15	77/m	PBK	OD	IOL explantation + AV	CFCF			Y	20/60	Subepithelial haze	6
16	66/m	PBK	OD	–	CFCF			Y	20/20		12
17	50/f	PBK	OD	–	CFCF	Secondary angle closure (Day 1) (due to floppy iris and air migration)	Peripheral anterior synechiolysis	Y	20/25	Subepithelial haze	12
18	50/m	PBK (PCIOL in AC), s/p Intravitreal Avastin	OD	IOL explantation	CFCF			Y	20/ 100	Macular changes	3
19	18/m	PBK s/p Macular changes	3	PPL + PPV + IOAB	OS	IOL repositioning	CFCF			Y	20/80

Table 1 continued

Case no.	Age/ gender	Indication	Eye	Additional procedures	Pre-op vision	Post-op events (duration)	Secondary intervention	Graft clarity Y/N	BCVA	Co-morbid condition affecting vision	Last follow up (months)
20	59/m	PBK	OD	–	CFCF			Y	20/50		3
21	59/m	PBK	OD	–	HM			Y	20/30	PCO	6
22	76/m	ABK	OD	–	HM			Y	20/ 400	Macular changes?	3
23	50/m	PBK	OS	IOL repositioning	HM			Y	20/ 400	Old CME	6

PBK pseudophakic bullous keratopathy, *ABK* aphakic bullous keratopathy, *TPK* therapeutic penetrating keratoplasty, *PK* penetrating keratoplasty, *GFS* glaucoma filtering surgery, *PPV* pars plana vitrectomy, *PPL* pars plana lensectomy, *IOAB* intraocular antibiotics, *IOL* intraocular lens, *AV* anterior vitrectomy, *CFCF* counting fingers close to face, *HM* hand motions, *PR* projection of rays, *AC* anterior chamber, *BCVA* best corrected visual acuity, *ASP* anterior stromal puncture, *ICE* iridocorneal endothelial

Fig. 1 **a**, **b** Slit lamp photographs of a representative case (Case 2) on post-operative day 1, showing a well-apposed and compact graft

A late post-operative complication encountered was graft rejection leading to graft failure in one patient. This patient was not compliant in using steroid medication.

Post-operative endothelial cell densities at the end of 6 months were available in 12 patients. The relative endothelial cell loss compared with measurements of the donor cornea was 27.25 % (range 6.9 % to 50.4 %).

Comments

Endothelial keratoplasty allows selective replacement of the dysfunctional endothelium with a healthy donor endothelium. In our center, the commonest indication for endothelial keratoplasty is corneal decompensation following previous cataract surgery. This is in contrast to the reports from Western countries where the vast majority of patients undergoing endothelial keratoplasty require it for Fuchs' endothelial dystrophy [6]. Stripping of the DM in endothelial

keratoplasty is necessary in cases where it is pathological, such as in Fuchs' endothelial dystrophy. This may not be required when the DM is optically clear, without any structural abnormalities. Endothelial keratoplasty performed without stripping the DM in cases where it is known to be not pathological, is a well-accepted variation of the standard procedure. This is particularly indicated when DM stripping may result in complications such as in patients with failed penetrating keratoplasty where dehiscence of the graft host junction may be caused or in long-standing bullous keratopathy patients where severe stromal edema may obscure visualization of the DM resulting in incomplete irregular DM stripping. The purpose of this retrospective analysis was to study the clinical outcomes of non-Descemet stripping automated endothelial keratoplasty performed for various indications.

Kobayashi et al. [3] have already reported excellent visual outcomes after non-Descemet stripping automated endothelial keratoplasty in six eyes with argon laser iridotomy induced corneal decompensation. In their study, all patients reached a BCVA of more than 20/32. In our series, although corneal edema cleared in all eyes, visual acuity ranged from 20/400 to 20/20. The most common indication in our series was corneal decompensation as a result of previous surgical trauma. Many of these eyes had a disorganized anterior chamber and macular changes (noted post-operatively) as a result of previous complicated surgery. There were several co-morbid factors affecting final visual acuity, such as macular changes, optic neuropathy, amblyopia, posterior capsular opacification and subepithelial scarring.

It was observed that following resolution of corneal edema, the slit-lamp appearance of the graft–host interface in non-stripping endothelial keratoplasty was not any different from that observed after Descemet stripping endothelial keratoplasty and it was not possible for the surgeon to clinically differentiate whether the Descemet membrane had been removed or left intact. The interface was optically clear and no haze was noted on clinical examination.

Only one patient had a graft adhesion problem. This patient, who had partial graft detachment, was successfully rebubbled with air injection. The other complication seen dueing the immediate post-operative period was secondary angle closure due to air migrating behind the iris. This was reversed by performing peripheral anterior synechiolysis. Corneal edema cleared in both patients after the secondary intervention. One patient developed a graft rejection episode at 6 months, which failed to recover.

The limitations of the study include the short duration of follow-up in some patients, and the heterogenous patient population with various associated co-morbid conditions. However, the results suggest that good clinical outcomes are achievable without stripping the Descemet membrane in endothelial keratoplasty. Further, comparative studies assessing other aspects of visual function, such as contrast sensitivity and higher-order aberrations, between non-stripping versus Descemet stripping endothelial keratoplasty may improve our understanding of the possible impact of retaining the Descemet membrane.

Acknowledgments Hyderabad Eye Research Foundation and Hyderabad Eye Institute. The authors do not have any financial interest or any conflicting relationship in any of the issues or products referred to in the manuscript.

Conflict of interest None.

References

1. Price FW Jr, Price MO (2006) Endothelial keratoplasty to restore clarity to a failed penetrating graft. Cornea 25: 895–899
2. Nikolic L, Jovanovic V, Lackovic V, Todorovic V (2010) Endothelial keratoplasty without Descemet's membrane stripping: histologic and ultrastructural findings. Ophthal Res 43:56–60
3. Kobayashi A, Yokogawa H, Sugiyama K (2008) Non-Descemet stripping endothelial keratoplasty for endothelial dysfunction secondary to argon laser iridotomy. Am J Ophthalmol 146:543–549
4. Chaurasia S, Muralidhar R, Murthy S, Garg P, Sangwan V (2011) Endothelial keratoplasty without stripping the Descemet's membrane. Br J Ophthalmol 95(10):1473–1474
5. Price MO, Price FW Jr (2010) Endothelial keratoplasty—a review. Clin Experiment Ophthalmol 38(2):128–140
6. Dobbins KR, Price FW Jr, Whitson WE (2000) Trends in the indications for penetrating keratoplasty in the Midwestern United States. Cornea 19:813–816