Results of Descemet Stripping Automated Endothelial Keratoplasty for the Treatment of Late Corneal Decompensation Secondary to Obstetrical Forceps Trauma

Vincenzo Scorcia, MD, Rocco Pietropaolo, MD,* Adriano Carnevali, MD,* Valentina De Luca, MD,* Andrea Lucisano, MD,* and Massimo Busin, MD*†‡*

Purpose: To describe the clinical outcomes of Descemet stripping automated endothelial keratoplasty (DSAEK) in a series of patients affected by progressive endothelial cell loss leading to corneal decompensation with Descemet membrane (DM) breaks caused by obstetrical forceps trauma.

Methods: Seven amblyopic eyes of 7 patients affected by unilateral visual loss due to increasing corneal edema were included in the study. In all eyes, slit-lamp examination revealed typical DM breaks and diffuse corneal edema: these findings were compatible with a history of obstetrical forceps-assisted delivery. DSAEK was performed in all cases (in 3 eyes combined with phacoemulsification and intraocular lens implantation); visual acuity, refraction, corneal topography, and endothelial cell density were recorded preoperatively and 1 year after surgery.

Results: Visual acuity improved in all cases by at least 2 Snellen lines; topographic astigmatism lower than 2.5 diopters was associated with better visual recovery. No intraoperative or postoperative complications were reported, and the corneas remained clear throughout the follow-up.

Conclusions: In eyes with endothelial decompensation secondary to DM breaks caused at birth by forceps injury, DSAEK can be performed uneventfully and restore cornea clarity. However, visual recovery is limited by the preexistent amblyopia, usually resulting from anisometropia and/or high-degree unilateral astigmatism. The results obtained in our patients suggest that low-degree astigmatism may be associated with better visual outcomes.

Key Words: forceps injury, endothelial keratoplasty, astigmatism, corneal decompensation

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From the *Department of Ophthalmology, University of Magna Graecia, Catanzaro, Italy; †Department of Ophthalmology, Ospedale Privato Villa Igea, Forlì, Italy; and ‡Istituto internazionale per la Ricerca e Formazione in Oftalmologia (IRFO), Forlì, Italy.

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Reprints: Vincenzo Scorcia, MD, Via dei Crociati 40, 88100 Catanzaro, Italy (e-mail: vscorcia@libero.it).

Descemet membrane (DM) breaks caused by obstetrical forceps injury are often an occasional finding during ophthalmologic examination; they appear as unilateral vertical or oblique striae on the inner corneal surface.[1] In addition, because of the effect of forceps compression on the affected eye, these patients also suffer from unilateral and/or asymmetric astigmatism of various degrees, which may induce amblyopia.[2] In some adults, the forceps injury is associated with progressive endothelial cell loss leading to corneal decompensation and visual loss. We report herein the outcomes of Descemet stripping automated endothelial keratoplasty (DSAEK) performed in adult patients for the treatment of corneal decompensation induced by forceps injury.

METHODS

We reviewed the clinical charts of seven adult patients affected by unilateral corneal decompensation due to obstetrical forceps injury, who underwent DSAEK at the Department of Ophthalmology of the University "Magna Graecia" (n = 4) or at the Department of Ophthalmology of Villa Igea (n = 3) between January 2010 and December 2013. All patients had had a complicated forceps-assisted delivery and had been diagnosed with relative amblyopia in the affected eye, which had not been apparently treated in any case.

Institutional review board approval was obtained from the University of "Magna Graecia"; the study followed the tenets of the 1964 Declaration of Helsinki and all patients had signed a detailed informed consent.

All patients underwent a routine, complete ophthalmologic evaluation including slit-lamp examination (Fig. 1A), intraocular pressure measurement with a Goldmann tonometer, uncorrected (UCVA) and best spectacle-corrected visual acuity (BSCVA) assessment; when corneal opacity did not allow fundus examination, a B-scan echography was performed. Anterior segment optical coherence tomography (SS-1000 CASIA, Tomey, Japan) was performed in both affected (Fig. 1B) and not-affected eyes; in particular, the topographic astigmatism was measured and compared between the 2 eyes of the same patient to evaluate the level of anisometropia induced by the forceps injury. In addition, endothelial cell density was measured using a noncontact specular microscope (EC-3000; Tomey, Japan).

DSAEK was performed according to a standardized technique previously described.[3] The affected DM-endothelium

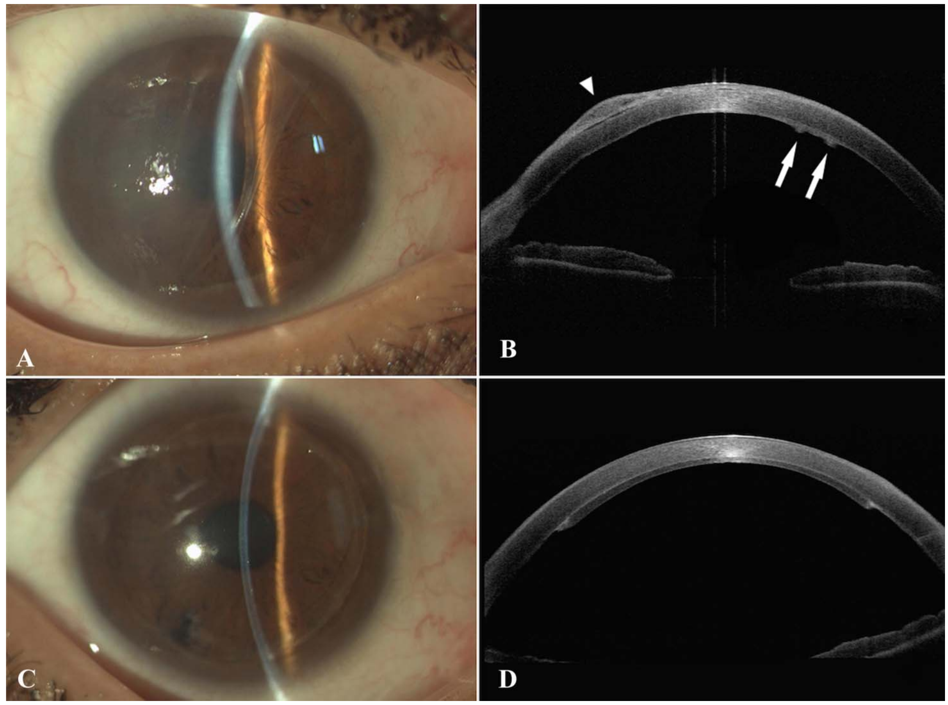

FIGURE 1. Clinical images of an eye affected by endothelial injury after forceps trauma. A, Preoperative slit-lamp photograph showing DM breaks sparing the central optical zone and corneal edema more pronounced in the paracentral (temporal) cornea; B, preoperative anterior segment optical coherence tomography scan showing the nodular thickening (arrows) on the posterior corneal surface and the epithelial (arrowhead) and stromal edema. C, One year after surgery the cornea was clear with no residual scars on the posterior stroma; D, the anterior segment optical coherence tomography reveals a well-positioned, thin, and regular lamellar graft.

complex was easily removed under air from the central 9 mm of the recipient cornea, if possible in a single piece, leaving a smooth posterior corneal surface; a peripheral iridectomy was performed at the 6-o'clock position with a vitrectome to prevent pupillary block. The donor lenticule was prepared using the automated lamellar therapeutic keratoplasty system (Moria, Antony, France) and then punched to a diameter of 9.0 mm with a Barron punch (Katena Products, Inc). An anterior chamber maintainer was placed at the 12-o'clock position, and the donor tissue was inserted into the anterior chamber under continuous irrigation with the pull-through technique using the Busin glide (Moria, Antony, France). At the end of surgery, all corneal entries were sutured airtight with 10-0 interrupted nylon sutures, and the anterior chamber was filled with air, which was left to reabsorb spontaneously. Postoperatively, dexamethasone phosphate 0.1% and tobramycin antibiotic eye drops were administered initially every 2 hours and then tapered over the following 3–4 months.

Postoperative controls were performed several times in all patients and each of them had a complete examination 1 year after surgery, as detailed above.

RESULTS

Seven eyes of 7 patients who had undergone a standard DSAEK procedure for the treatment of forceps injury induced corneal edema were identified; in 3 eyes surgery was combined with phacoemulsification and intraocular lens (IOL) implantation in the capsular bag.

Demographic data and results are summarized in Table 1; no intraoperative or postoperative complications were recorded in any case.

The average follow-up time was 39.0 ± 12.8 months (range = 56–19 months). At the latest follow-up examination, BSCVA improved in all cases, ranging from 20/200 to 20/40; preoperative topographic astigmatism (mean ± SD) averaged

TABLE 1. Demographic Data and Main Outcomes Recorded 1 Year After Surgery

					Visual Acuity		ECD			
Pt	Age, yr	Sex	Eye	Surgery	Pre	Post	Pre*	Post	TCyl	TAD
1	60	M	OD	DSAEK + Ph + IOL	20/100	20/40	2600	1865	2.2	2.0
2	39	F	OS	DSAEK	20/800	20/200	2800	1680	5.1	4.1
3	44	F	OD	DSAEK	20/200	20/50	2900	1804	3.5	2.0
4	58	M	OD	DSAEK + Ph + IOL	20/100	20/50	2600	1895	3.8	2.5
5	44	M	OS	DSAEK	20/800	20/200	2700	1855	7.3	5.8
6	54	F	OS	DSAEK + Ph + IOL	20/800	20/40	2600	1767	2.5	1.5
7	46	M	OS	DSAEK	20/200	20/50	2800	1828	3.0	2.1

ECD, endothelial cell density (*eye bank data); F, female; M, male; Ph, phacoemulsification; Post, postoperative; Pre, preoperative; Pt, patient; TAD, topographic astigmatism difference; TCyl, topographic cylinder; yr, years.

3.9 ± 1.8 D (diopters) ranging from 7.3 to 2.2 D; the averaged topographic astigmatism difference between eyes was 2.8 ± 1.5 D ranging from 1.5 to 5.8 D. The corneas kept clear throughout the observation period (Figs. 1C, D) and the endothelial cell density recorded 12 months after surgery was 1813 cells per square millimeter (range = 1680–1895 cells per square millimeter).

DISCUSSION

The use of obstetrical forceps to assist birth is a relatively rare cause of corneal injury; the direct compression of the instrument on the cornea creates breaks in the DM and a permanent distortion of its shape, resulting in astigmatism of various degrees with the steep keratometric axis usually parallel to the directions of the DM breaks.

If not properly and quickly managed, refractive anisometropia causes amblyopia[4]; instead, even rather severe, endothelial cell damage is usually compatible with corneal transparency but may sometimes lead to corneal decompensation in adulthood.

Recently, single case reports have described the feasibility of DSAEK to treat corneal decompensation secondary to forceps injury.[5] Further study has shown that graft adhesion is not affected in these eyes by the presence of the DM breaks, which may theoretically create some irregularity in the posterior corneal surface.[6] Ponchel et al[7] recently also reported the efficacy of DSAEK in a child with clear cornea where the procedure was aimed at simply removing the striae from the posterior corneal surface to clear the optical zone and improve vision.

Although the efficacy of DSAEK in clearing the affected cornea is undisputed,[8] visual recovery of these eyes is strongly limited by the presence of amblyopia, which is usually more severe if accurate refractive correction associated with occlusion therapy is not prompted started in the first years after birth.[4,9] Corneal edema occurs at a late stage in the adulthood of these patients and probably plays no role in the development and degree of amblyopia; moreover, in some cases forceps lesions may spare the central optical zone but cause more paracentral or peripheral stromal edema (Fig. 1).

In our series, although BSCVA improved in all cases, postoperative visual acuity never exceeded 20/40; the best outcome (20/40) was obtained in the 2 eyes (patients 1 and 6, Table 1) with lowest astigmatism and topographic astigmatism difference below 2 diopters. These results suggest that preoperative astigmatism, nowadays measurable by means of anterior segment optical coherence tomography technology even in the presence of corneal edema, should always be evaluated as a predictive parameter for the visual outcome; in addition, it should be compared with the contralateral not-affected eye to estimate the magnitude of anisometropia.

Performing DSAEK in astigmatic eyes does not correct the refractive error; although centering the main incision on the steepest meridian could help decrease the astigmatism, the small incision (2.75 mm) used for DSAEK would probably be of limited effect. As previously described, in those eyes undergoing DSAEK in combination with phacoemulsification, high- or even low-degree astigmatism could be corrected by means of toric IOL implantation.[10] Nevertheless, in the eyes of our series we chose to implant a conventional monofocal IOL because of the presumed limited perception of the benefit related to a premium IOL by an amblyopic eye.

Amblyopia was the main factor limiting the visual outcome of DSAEK also in the eyes of our series. Proper amblyopia treatment during childhood would certainly further improve the visual prognosis at least in those patients with low-degree refractive errors and anisometropia; for this reason, a careful detection of refractive error and amblyopia should be recommended soon after the acute birth injury.

In conclusion, our case series confirms the feasibility of DSAEK for the treatment of corneal edema related to forceps injury and indicates that eyes with low-degree preoperative astigmatism and anisometropia could have better visual potential.

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