Novel Technique for the Preparation of Corneal Grafts for Descemet Membrane Endothelial Keratoplasty

MARC MURAINE, JULIE GUEUDRY, ZHIGUO HE, SIMONE PISELLI, SABINE LEFEVRE, AND DAVID TOUBEAU

- PURPOSE: To report a simple novel technique to facilitate preparation of Descemet membrane grafts for Descemet membrane endothelial keratoplasty (DMEK).
- DESIGN: Laboratory investigation and retrospective, single-center, consecutive case series.
- METHODS: Preparation of the endothelial graft is performed on an artificial anterior chamber, endothelial side up. After an incomplete circular superficial trephination, we describe a simple technique using a 27 gauge cannula to detach the Descemet membrane (DM). Endothelial cell density (ECD) was measured before dissection on 12 human corneas for research and 3 days after storage in organ culture. Histologic and electron microscopy analysis were performed. A DMEK was performed in 50 patients with Fuchs dystrophy. Visual acuity and ECD were evaluated 2 and 6 months after surgery.
- RESULTS: ECD was 2765 ± 256 cells/mm² on corneas for research before dissection and 2651 ± 305 cells/mm² after 3 days in organ culture (P < .01). Histologic and electronic sections confirm that the cleavage was between DM and posterior stroma. Clinically, preparation of 2 corneas from a single donor was unsuccessful; 48 corneas were clear at 2 months and 47 at 6 months. At 2 months 77% of the patients had recovered a visual acuity of at least 20/30. At 6 months, 91.5% of the patients had a visual acuity of at least 20/30. ECD was 2656 ± 28 cells/mm² (range: 2450-3100 cells/mm²) preoperatively, 1797 ± 41 cells/mm² (range: 1100-2700 cells/mm²) at 2 months, and 1658 ± 43 cells/mm² (range: 900-2600 cells/mm²) at 6 months.
- CONCLUSION: We report here a reliable and efficient technique for the preparation of pure Descemet membrane grafts. (Am J Ophthalmol 2013;156: 851–859. © 2013 by Elsevier Inc. All rights reserved.)

The use of endothelial grafts has greatly increased over the last 10 years, gradually replacing penetrating keratoplasty in cases in which a corneal graft is necessary following Fuchs dystrophy, bullous keratopathy, or the failure of previous penetrating keratoplasty.1 Endothelial graft techniques have proved to be superior, because the introduction of such grafts via a small incision can reduce astigmatism, prevent fragility following circular trephination, and accelerate visual recovery. Several techniques for preparation of the posterior graft are currently available. The most popular is known as Descemet stripping automated endothelial keratoplasty (DSAEK).2 This technique has the advantage of being simple, in terms of both the cutting of the graft and its introduction into the anterior chamber. The second technique is Descemet membrane endothelial keratoplasty (DMEK), in which the posterior graft includes only the Descemet membrane and the endothelium.3 The graft is prepared manually in this case. It is clear from published articles reporting the outcome of endothelial grafts and from retrospective series comparing these techniques that visual recovery is better after DMEK than after DSAEK, probably because of the absence of residual stroma. However, DMEK techniques are not particularly simple to carry out, and there is always a risk of endothelial tearing during the graft preparation procedure.

We describe here a new technique for the preparation of pure Descemet membrane grafts that seems simpler than previously described techniques. We present a detailed description of this technique and a histologic analysis of the prepared graft. We then evaluate the possible endothelial trauma induced by this method, using eyes from an eye bank, and we report a clinical evaluation of the use of grafts of this type in a series of patients.

PATIENTS AND METHODS

The study consisted of a laboratory investigation and retrospective, single-center, consecutive case series. We carried out a retrospective, single-center, consecutive case series at Charles Nicolle University Hospital (Rouen, France). The institutional review board (IRB; CPP Nord-Ouest 1) declared that the type of retrospective study waived the need for IRB approval, in accordance with French law on human clinical trials. Informed consent was obtained from each patient. The research adhered to the tenets of the Declaration of Helsinki.

• DESCRIPTION OF THE TECHNIQUE FOR DESCEMET MEMBRANE GRAFT DISSECTION: For this study, we used
12 corneal grafts destined for use in research. These were normal tissues procured after relatives had been informed, as authorized by French bioethics law. They were not suitable for transplantation owing to inconclusive donor serology, despite normal endothelial characteristics. In all cases, the grafts were stored in organ culture at 31°C, the prevalent method used in European eye banks, in Cornea-Max medium (Eurobio, Les Ulis, France) for 2-3 weeks.

The technique is described in Figure 1 and Video 1 (Supplemental Material, available at AJO.com). A trephination blade with a diameter of 8-8.5 mm (Moria, Anthony, France) must first be broken to generate a fragment 3-4 mm long. (Top row, left and center) A trephination blade must first be broken to generate a fragment 3-4 mm long. (Top row, right) The cornea is positioned on an artificial anterior chamber with the endothelium uppermost. (Second row, left) The blade is pressed against the corneal endothelium and trephination of the Descemet membrane occurs over 330 degrees. (Second row, center and right) The artificial anterior chamber is then closed, with the endothelium still uppermost, and air enters the anterior chamber. This leads to an inversion of the cornea, with the endothelium bulging upwards. (Third row) On either side of the zone where Descemet membrane is not cut, the peripheral endothelium can be detached very easily using a spatula or the jaws of a Troutman forceps (left and center) in such a way as to create a small easily lifted flap not colored by trypan blue (right). (Fourth row, left) The jaws of a pair of Troutman forceps are slipped under the flap to ensure the correct detachment of the Descemet membrane over a length of 2-3 mm. (Fourth row, center and right; Fifth row, left and center) The rest of the dissection is then carried out with a 27 gauge cannula mounted on a syringe filled with balanced salt solution (BSS). The injection of BSS at this point readily detaches the endothelium by hydrodissection, in front of the cannula. Once the center of the endothelium is reached, it is straightforward to detach the Descemet membrane on either side, from right to left, up to the zone of trephination. (Bottom row, right) At the end of the dissection, the graft remains in contact with the underlying stroma because it is simply placed on top, not actually immersed.
a fragment 3-4 mm long. The cornea to be dissected is positioned on the concave surface of an artificial anterior chamber (Moria) or any other concave material, with the endothelium uppermost. The blade is then held in Halstead forceps (Moria) and pressed against the corneal endothelium so as to section the Descemet membrane in a circular manner. Trephination of the Descemet membrane therefore occurs over 330 degrees, rather than 360 degrees. It is essential to curve the blade slightly toward the exterior after it has been broken to prevent the tearing of the Descemet membrane at the transition between the trephined section and the peripheral cornea (30 degrees). This ensures that any tearing occurs from the center to the periphery rather than in the opposite direction (Figure 2). The depth of trephination is not important and can therefore just as easily be 50 \( \mu \mathrm{m} \) as 500 \( \mu \mathrm{m} \). The essential point is the sectioning of the Descemet membrane over 330 degrees and the avoidance of perforating trephination. The circular trephination blade must be held in a vertical position and the graft must be well centered and flattened. No force should be applied to the rotation, to prevent membrane tearing. The artificial anterior chamber is then closed, with the endothelium still uppermost, and air enters the anterior chamber. This leads to an inversion of the cornea, with the endothelium bulging upwards. We used the Hanna 18095C artificial chamber (Moria), which was designed for the preparation of grafts for penetrating keratoplasty. However, any single-use artificial chamber can also be used. Air is injected into the anterior chamber at a sufficiently high pressure to turn the cornea over. This pressure was not measured, but should be sufficiently high for the cornea to be well stretched in the inverse position. An assistant may hold the air-filled syringe to maintain the pressure, or the tube supplying air may be clamped close to the anterior chamber. The surplus culture medium is then removed from the side with a microspatula and the endothelium is then stained with trypan blue (Eurobio). This is necessary to ensure perfect visualization of the zone of Descemet membrane trephination. The Descemet membrane must be sectioned over 330 degrees; if necessary, this can be achieved for nontrephined zones with a 15-degree knife.

The graft is then rinsed with balanced salt solution (BSS) to remove excess trypan blue, and a cohesive viscoelastic droplet is placed on the endothelium to prevent its drying, particularly at the apex. It is then necessary to focus on the nontrephined zone (30 degrees). At this site, there is a zone of continuity between the central and peripheral endothelia. On either side of this zone of continuity, the peripheral endothelium can be detached very easily, in a single movement, with forceps. It is important to get hold of the peripheral Descemet membrane at the precise site of trephination. In this way there is no contact with the central endothelium, only with the peripheral zone, and, provided there is sufficient pressure in the anterior chamber, the Descemet membrane is easily detached. The peripheral endothelium is thus torn in the region of the zone of continuity in such a way as to create a small, easily lifted flap in this area. A small spatula or the jaws of a pair of Troutman forceps (Moria) should then be slipped into the opening to ensure the correct detachment of the Descemet membrane over a length of 2-3 mm. The rest of the dissection is then carried out with a 27 gauge cannula (FCI, Paris, France) mounted on a 2.5-ml syringe filled with culture medium or BSS. The 27 gauge cannula is slipped under the flap and Descemet membrane is detached with hydrodissection. Once the center of the endothelium is reached, it is straightforward to detach the Descemet membrane on either side, from right to left, up to the zone of trephination. It is then possible to extend the hydrodissection straight to the opposite zone of Descemet membrane trephination, and then to detach the endothelium on either side right up to the periphery. At the end of the dissection, the graft remains in contact with the underlying stroma because it is
simply placed on top, not actually immersed. However, it is important to ensure that it does not slide too much to the side and to recenter it if necessary.

- **ANALYSIS OF DISSECTED DESCemet MEMBRANE GRAFTS:** On the morning of dissection, for each graft, we evaluated endothelial density by the classical method: 2-3 drops of 0.4% trypan blue (Eurobio) were placed in the concavity of each cornea and incubated for 1 minute. The corneas were then immersed for 4 minutes in sterile 0.9% NaCl (packaged as single doses; Gilbert, Hérouville Saint-Clair, France). The trypan blue stained the nuclei of the dead cells and immersion in NaCl made it possible to determine cell density by dilating the intercellular spaces. The cornea was then placed under a light microscope and cell density was evaluated with a semi-automatic program (Image-Pro, Image Processing and Analysis Software; MediaCybernetics, Rockville, Maryland, USA). The percentage of dead cells was also determined by counting the cells with a blue-stained nucleus.

After this initial evaluation, the grafts were dissected as described above and then cultured for 3 days in Eurobio CorneaMax storage medium. For our evaluation of this technique with corneas not suitable for transplantation and in order to maintain Descemet membrane attached to the corneoscleral graft during storage, we left the Descemet membrane graft attached to the residual cornea at 2 small peripheral adhesion points at opposite ends, which we did not dissect. However, the detachment was clearly complete. Another endothelial evaluation was then carried out 3 days later.

Five corneas were fixed in 10% neutral buffered formalin and hematoxylin-eosin sections were examined for histology analysis. Five corneas were fixed in 1% glutaraldehyde/0.5% paraformaldehyde in 0.1 M mono Na/diK buffer (pH 7.4), postfixed in 1% osmium tetroxide in 0.1 M cacodylate buffer for 1 hour, dehydrated in a graded series of ethanol, and embedded in Epon resin. Ultrathin (90-nm) sections were cut and stained with uranyl acetate and lead citrate. Photographs of Descemet membrane and posterior stroma were taken with a transmission electron microscope (model H-800; Hitachi, Tokyo, Japan) equipped with a CCD camera (XR40; AMT, Danvers, Massachusetts, USA).

- **PATIENTS:** DMEK was performed by 1 surgeon (M.M.) on 50 consecutive eyes, in 50 patients, all suffering from primary Fuchs endothelial dystrophy with no other associated ophthalmologic diseases. The patient sample consisted of 28 women and 22 men, with a mean age of 65 ± 6 years (range: 45-78 years). Twenty-four patients underwent cataract surgery at the same time as DMEK, whereas the other 26 patients were already posterior chamber pseudophakic.

Snellen BCVA (best-corrected visual acuity), manifest refraction, and endothelial cell density were recorded 2 and 6 months after surgery. Eventual complications (graft dislocation, graft failure, graft rejection) were also recorded at 1 week, 2 weeks, 1 month, 2 months, and 6 months after surgery. Mean donor age was 64.4 years (range: 40-79 years). Corneas were stored for 18 days (range: 9-25 days) in tissue culture medium before dissection and graft.

In the postoperative period, all the patients were treated with eye drops containing a combination of dexamethasone and tobramycin 3 times daily for 2 months. They then received dexamethasone alone, in the form of eye drops administered twice daily for 2 months and then once daily for 1 year.

Postoperative cell density was measured with a Topcon SP-2000 specular microscope (Topcon, Saint-Denis, France), with the center's method and the manufacturer's calibration and software. Manual counts were averaged from 3 independent images.

Descriptive statistics for normally distributed variables are reported as means, standard deviations, and ranges. Differences between preoperative and postoperative values were analyzed in paired-difference t tests. Data were analyzed with GraphPad InStat software 3.0 (GraphPad Software, San Diego, California, USA). P values less than .05 were considered statistically significant.
SURGERY: Descemet membrane implantation was possible in all cases. The endothelial graft, still stretched over the donor stroma, which was itself maintained on the artificial anterior chamber, was folded over itself, with the endothelium towards the interior, with the aid of the 27 gauge cannula, as indicated in Figure 3 and Video 2 (Supplemental Material, available at AJO.com). The Descemet membrane graft, rolled up with the endothelium on the inside, was guided into the chamber of an intraocular lens (IOL) injection cartridge designed for 2.2-mm implantation (Viscojet injector set 2.2; Medicel, Wolfhagen, Switzerland) as reported by Kruse and associates.4 A hook was then used to pull the graft close to the opening. Once the diseased endothelium had been removed from the patient via a 2.8-mm incision, the cartridge was fixed to the end of a cannula adapted to its internal diameter, which was then fixed onto a 2.5-mL syringe filled with BSS. The cartridge was introduced into the incision, rotating it through 180 degrees, and the endothelial graft was then injected into the anterior chamber by expelling the BSS from the syringe. At this point, the graft was placed in the anterior chamber with its stromal surface towards the cornea and the endothelial surface directed toward the iris. The graft was then progressively deployed by the injection of BSS, a process that may take some time. Ideally, the graft should be held in place with a 30 gauge needle mounted on a syringe containing BSS and introduced via puncture of the anterior chamber from above. Only when the graft appeared to be perfectly centered was an air bubble released to maintain the graft in the center of the cornea.

At the end of the intervention, the graft is held in place by an air bubble occupying 90% of the anterior chamber. All the patients were examined in a sitting position a few hours after the intervention to check for the absence of ocular hypertonia.

RESULTS

• CELLULAR AND HISTOLOGIC ANALYSIS OF THE DESCEMET MEMBRANE GRAFT PREPARATION: Dissection of pure Descemet membrane, without tearing, was possible on the 12 grafts used for research. Endothelial density before dissection was $2765 \pm 256$ cells/mm$^2$ (range: 2300-3100 cells/mm$^2$). Three days after dissection, the endothelial density of the dissected grafts was $2651 \pm 305$ cells/mm$^2$ (range: 2100-3050 cells/mm$^2$). There was therefore a 4.12% decrease in endothelial density ($P < .01$). Histologic analysis after hematin-eosin-safran (HES) staining confirmed the absence of stroma and the presence of Descemet membrane only (Figure 4). Five corneas after manual Descemet membrane stripping were observed by transmission electron microscopy and showed the absence of almost the whole Descemet membrane from the posterior stroma (Figure 5). A residual Descemet membrane with thickness less than 500 nm remained stuck on posterior stroma (Figure 5, Left). Detachment of Descemet membrane did not occur between adult and embryonic Descemet membrane but between Descemet membrane and posterior stroma.

• CLINICAL STUDY: Fifty patients with isolated Fuchs dystrophy underwent DMEK with graft preparation as described above. Two grafts were lost during dissection of Descemet membrane and DMEK was performed using a back-up graft in both cases. All the patients had an attached graft the evening following the intervention. Two patients (4%) had to undergo a repeat procedure in the following 2 months because of primary failure. In both these cases, the graft was initially well applied at the end of the intervention, but subsequently rolled up on itself (1 case) or detached (1 case). Graft replacement posed no particular problem. Nevertheless, the postoperative period was marked by partial detachment of the Descemet membrane requiring an injection of air in the days or weeks following the intervention in 14 of the 50 cases (28%). In the other 48 cases, the cornea was clear, with an adherent and functional graft, at 2 months. One patient presented a definitive rejection of the graft 5 months after the intervention and had to undergo a repeat graft 6 months later. No other signs of rejection were detected during the 6-month follow-up period in any of the other patients. At 6 months, the remaining 47 grafts were clear and functional.

At 2 months, best-corrected visual acuity was greater than 20/40 in all 48 cases, with clear cornea, and 77% of the patients (37/48 patients) had recovered a visual acuity
of at least 20/30. At 6 months, 91.5% of the patients (43/47 patients) had a visual acuity of at least 20/30.

Preoperative endothelial cell density was 2656 ± 28 cells/mm² (range: 2450-3100 cells/mm²). At 2 months, mean endothelial cell density was 1797 ± 41 cells/mm² (range: 1100-2700 cells/mm²). At 6 months, mean endothelial cell density was 1658 ± 43 cells/mm² (range: 900-2600 cells/mm²). This decrease was significant at 2 and 6 months (P < .01).

**DISCUSSION**

**OUR OBJECTIVE WAS NOT TO REPORT A SURGICAL TECHNIQUE PROVIDING IMPROVEMENTS IN TERMS OF VISION OR ENDOTHELIAL TRAUMA VS OTHER DMEK TECHNIQUES, BUT TO DESCRIBE A TECHNIQUE THAT APPEARS SIMPLER TO PERFORM THAN THE TECHNIQUES CURRENTLY IN USE. DMEK IS THE SURGICAL TECHNIQUE GIVING THE BEST RECOVERY OF VISUAL ACUITY IN PATIENTS WITH FUCHS DYSTROPHY.**

After surgery, there is no interface that could potentially limit vision and none of the centering problems that may be observed after DSAEK. In fact, in the DSAEK technique the grafts are always thinner in the center than at the edge, because the cut is made parallel to the anterior surface of the cornea. Consequently, to obtain the best possible recovery of sight after DSAEK, the optical axis of the graft has to be perfectly aligned with that of the recipient, a result that is very difficult to obtain. By contrast, in DMEK the graft has no meniscus effect and, therefore, no optical effect. Its centering thus has no effect on the final result in terms of vision. This is, in our opinion, another possible reason for the superiority of DMEK over DSAEK.

However, the preparation and manipulation of such a fine graft is not easy, and only experienced surgeons carry out this risky technique. There is a non-negligible risk of graft tearing during preparation and of damage to the endothelial cells during the manipulation of the graft in the anterior chamber. Melles and Price have described a technique for dissecting the Descemet membrane by detachment from the periphery with 2 pairs of forceps, the cornea concavity being filled with culture medium or BSS. Highly experienced teams are able to achieve very low rates of failure, about 1%, in the preparation of DMEK grafts, but this is not the case for teams wishing to start using this type of technique. The technique we developed appears to be very simple to carry out, even by an inexperienced surgeon. The originality of our technique lies in the trephination of the membrane over only 330 degrees before its detachment. Indeed, if trephination is carried out over 360 degrees, it is very difficult to differentiate the Descemet membrane plane from the general trephination zone, the spatula being used for intrastromal dissection. It is much easier to detach the Descemet membrane at the edge of the trephination zone, between this zone and the limbus. The cornea is sufficiently distended to be held with forceps or lifted off with a spatula. This gave us the idea of trephination over only 330 degrees, leaving a zone of continuity between the periphery and the center over the remaining 30 degrees.

The results of endothelial analysis confirmed that this procedure is not very traumatic, as less than 5% of the...
endothelial cells were lost. We were careful to ensure that the nontransplanted grafts were analyzed again after 3 days in culture, as immediate counting would not provide reliable measurements of density. These 3 days in culture allowed the cells traumatized by the dissection to be released into the medium. These results are quite comparable with those reported by Melles, with a mean density of 2701 cells/mm$^2$ before dissection and of 2604 cells/mm$^2$ after 1 week of organ culture.\textsuperscript{23} In contrast, Krabcova and associates report a higher endothelial cell loss when descemetic graft was manually prepared with a corneal rim, suggesting that detachment of Descemet membrane with air big bubble could be traumatic for endothelial cells.\textsuperscript{24}

Finally, despite the overall low graft loss rate, 2 grafts were lost during dissection of Descemet membrane, but this complication can also sometimes occur when preparing a DSAEK. Both these grafts were obtained from the same 40-year-old donor, who appeared to have a particularly fine Descemet membrane. With experience, we have found that it is best to use grafts from donors over the age of 60 years, in whom the Descemet membrane is thicker, facilitating manipulation. Moreover, as Schlötzer-Schrehardt and associates\textsuperscript{25} have shown with histology, some people have obvious adhesions between Descemet membrane and stroma that probably resist separation. Therefore, if difficulty is encountered in preparing the first cornea from a pair for DMEK, it is probably advisable to allocate the second cornea of the pair from that donor for use with a different keratoplasty procedure. In comparison, Price and associates\textsuperscript{7} reported in 2009 that the Descemet membrane could not be stripped successfully in 12 of 72 donor corneas. This suggests that our technique may be easier to reproduce, at least initially. On the other hand, our graft loss of 4% of cases may appear higher than the loss of 1% reported for the forceps technique in other studies.\textsuperscript{9} However, this loss of 1% corresponds to the rate of loss encountered in interventions carried out by someone with considerable experience in the DMEK preparation technique and is not reproducible by most surgeons. Interestingly, the relatively high failure rate reported by Price in 2009 corresponded to a learning phase, and the rate subsequently decreased, with no tearing reported during the preparation of 96 grafts in 2011.\textsuperscript{7} Having used both techniques, we feel that the method presented here is much more accessible to much less experienced surgeons.

Another advantage of the technique described here is that the graft is rolled up with the endothelium on the inside of the roll rather than on the outside. This probably provides better protection for the endothelium during graft manipulation. Indeed, in previously reported techniques, the graft was left free in the storage medium after its preparation and invariably rolled up with the endothelium towards the outside.\textsuperscript{5,17,19} This organization requires the surgeon to take numerous precautions to prevent the formation of endothelial cell lesions.

The endothelial cell densities recorded for our patients 2 and 6 months after the intervention were not very different from previously reported values. At 6 months, endothelial cell density had decreased by 38%, a value very similar to that of 36% reported by Price at 1 year\textsuperscript{7} or by Ham and associates.\textsuperscript{26} Given that the decrease in endothelial cell density is greatest in the first 2 months and that we believe that the endothelium is better protected because of its internal position in our procedure, we suggest that the early cell death reported in all studies probably results from the transfer of the graft from its storage conditions to the physiological conditions of the anterior chamber.

The recovery of visual acuity reported in our study is very similar to that reported in other studies in patients with Fuchs dystrophy without other pathologies.\textsuperscript{5,8,9,26} The values obtained confirm the superiority of DMEK over DSAEK for Fuchs dystrophy patients.

The most frequently encountered problem is that it is more difficult to obtain descemetic graft adhesion than reported for the thicker grafts used in DSAEK. We believe that this problem may be caused by poor correspondence between the curves of the graft and of the posterior cornea of the recipient rather than a true problem of adhesion between tissues. When this problem occurs in cases of a very fine graft, peripheral detachment results in the irreversible rolling up of the graft towards the cornea of the recipient. In such cases, a bubble of air should be reinjected as a matter of urgency, before the transplanted Descemet membrane has rolled up too much. With thicker grafts, there is little chance of the graft rolling up, even if the curves are different, and the cornea will eventually adhere. It is possible that the graft that did not adhere in our series was positioned upside down, but this was clearly not the case for the other 49 grafts.

The air reinjection rate reported here (28%) is high, but it is nonetheless lower than the rates of 30%-63% reported in previous studies.\textsuperscript{5,8,9,26,27} We try to make sure that the anterior chamber is well filled with air at the end of the intervention, even if we sometimes have to remove a little air a few hours later during the systematic slit-lamp evaluation. By contrast, it should be noted that currently there is no rebubbling in the group of Melles, whereas rebubble rates are less than 10% for Kruse’s group and between 10% and 20% for Price’s group. However, it is relatively easy to inject air into the anterior chamber of a patient seated in front of a slit lamp, and we tend to add air to the anterior chamber early if the graft shows signs of rolling up at the edges. This may not be useful in all cases.

We found only 1 case of graft rejection: it was at 5 months (2%), despite adequate corticosteroid treatment, leading to corneal decompensation despite appropriate treatment. This confirms the relatively low rejection rates reported in previous studies, particularly when DMEK is carried out in patients with isolated Fuchs dystrophy and, thus, with no particular risk factors.\textsuperscript{23,28–31}
We propose here an innovative technique for the preparation of grafts for DMEK. This technique is simple to perform and highly reproducible, and we hope that its use will facilitate the spread of DMEK in this type of patient. The introduction of the graft, with the endothelium towards the inside of the rolled-up graft, is probably simpler than current DMEK techniques, but it nonetheless requires a certain degree of know-how.

REFERENCES

REPORTING VISUAL ACUITIES

The AJO encourages authors to report the visual acuity in the manuscript using the same nomenclature that was used in gathering the data provided they were recorded in one of the methods listed here. This table of equivalent visual acuities is provided to the readers as an aid to interpret visual acuity findings in familiar units.

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