Abstract

Purpose: The learning curve of Descemet Membrane Endothelial Keratoplasty (DMEK), like any surgical technique, may be discouraging for novel surgeons. Our purpose was to evaluate the clinical outcome of standardized 'no-touch' DMEK and its complications during the learning curve of surgeons starting with DMEK in different centers worldwide. *Material and methods:* Retrospective multicenter interventional study. DMEK was performed in 431 eyes of 401 patients diagnosed with either Fuchs endothelial Dystrophy (FED; 68%) or Bullous Keratopathy (BK; 32%). The surgeries represented the learning curve of novel surgeons in 18 different centers in 11 different countries. Best corrected
visual acuity (BCVA), endothelial cell density and intra- and postoperative complications were recorded. *Results:* Overall, BCVA improved in 94% of the cases, remained unchanged in 4% and deteriorated in 2%. Visual acuity data up to 6 months were pooled and showed that 79% reached a BCVA of ≥20/40 (≥0.5), 43% ≥20/25 (≥0.8), and 22% ≥20/20 (≥1.0). Average decrease in endothelial cell density at 6 months was 47% with a wide variation between different centers. Intraoperative complications were rare (1%), including difficulties in inserting, unfolding or positioning of the graft. The main postoperative complication was graft detachment (35%); 20% underwent a single rebubbling
procedure, occasionally requiring a second (3%) or a third re-bubbling (1%) and 18% underwent a secondary keratoplasty. Regression analysis indicated that the type of inserter, the graft storage medium and the airbubble time may affect graft detachment incidence. *Conclusions:* This first multicenter DMEK trial worldwide showed that the standardized DMEK technique was feasible in most hands. Surgeons starting with DMEK achieved results comparable to more experienced groups and were encouraged to continue. Differentiations in the technique may (or may not) affect the outcome. When successful, the visual outcome after DMEK may be relatively independent of the technique's learning curve.
Since 1998, the Netherlands Institute for Innovative Ocular Surgery (NIIOS) introduced various techniques for endothelial keratoplasty, currently referred to as deep lamellar endothelial keratoplasty (DLEK), Descemet stripping (automated) endothelial keratoplasty (DSEK/DSAEK), and Descemet membrane endothelial keratoplasty (DMEK).1-6 The latter technique, in which only the donor Descemet membrane (DM) and its endothelium are transplanted, allows for better outcomes than all other keratoplasty techniques currently available, with 94% of eyes reaching a best (spectacle) corrected visual acuity (BCVA) of ≥20/40 (0.5), while 77% reach ≥20/25 (0.8), and 47% ≥20/20 (1.0) within 6 months.7,8 With DLEK and DSEK/DSAEK, we noticed that surgeons were sometimes unable to successfully start with these techniques, owing to difficulties with donor tissue preparation and/or a lack of technique standardization. With DMEK, we therefore designed both the technique for preparing the donor DM and the surgery itself, as standardized 'no-touch'
procedures.9,10 The first DMEK outcomes of former NIIOS course participants were collected in order to document their experiences in starting out with DMEK as well as to evaluate its clinical outcome.
Because recognition of the problems and complications associated with commencing with a new procedure may enable further technique improvements, recommendations and/or logistic support, the aim of our study was to evaluate the clinical outcome of 431 DMEK eyes, i.e. the first clinical series of 18 different surgeons, located in 11

different countries. *Keywords*: Descemet membrane endothelial keratoplasty, Fuchs endothelial dystrophy, bullous keratopathy, surgical technique.