PROTECTING DISEASED ENDOTHELIUM

Careful cataract surgery, new lamellar techniques improve results

by Howard Larkin in Vienna

For cataract patients with endothelial disease careful surgical technique and the timing of cataract extraction are crucial to preserve endothelium and restore vision, Friedrich E Kruse MD, University Hospital Erlangen, Bavaria, Germany, told an EuCornea/ESCRS symposium at the XXIX Congress of the ESCR.

With new techniques such as Descemet’s membrane endothelial keratoplasty (DMEK), which produces more-predictable refractive results and quicker recovery than penetrating or Descemet’s-stripping keratoplasty, combining lamellar surgery with phacoemulsification and intraocular lens (IOL) implantation has become an increasingly attractive option, he noted.

“Over the years we have experienced a great variation in our understanding of the role of the endothelium and how we are going to preserve this endothelium in cataract surgery. And now that we have lamellar surgery we are again facing a change of concepts because some of us are paying less attention to the endothelium because we just have better techniques of keratoplasty,” Prof Kruse said.

Growing knowledge Since the 1950s, a great deal has been learned about how different surgical approaches affect the endothelium, much of which has implications for how surgery is done today, Prof Kruse noted.

Endothelial cell loss is related to the degree of surgical trauma (Sugar et al. Arch Ophthalmol 1978 Mar; 96:449-50), and posterior chamber phaco produces about the same loss as intracapsular extraction (Kraft et al. Arch Ophthalmol 1980 Oct; 98:1782-4). Phaco and extracapsular extraction also produce similar endothelial cell loss, in the range of 10 per cent to 20 per cent (Bourne et al. Ophthalmology 2004 Apr; 111:679-685), and loss rates are similar for phaco and small-incision manual cataract surgery, in which the nucleus is expressed with viscoelastics (Gogate et al. J Cat Ref Surg 2010 Feb; 36:247-253). Incision location and size can significantly influence the outcome, Prof Kruse noted.

Results for eyes with diseased endothelium are similar, Prof Kruse said. One study found that eyes with preoperative endothelial cell density between 500 and 1000 per mm² lost about the same percentage of cells as normal control eyes, but showed no significant difference in central corneal thickness at three months (Hayashi et al. J Cat Ref Surg 2011 Aug; 37:1419-1425). Results were similar for Fuchs’ dystrophy and other non-progressive pathologies. Another study found that eyes that have undergone penetrating keratoplasty, phaco results in about a 20 per cent loss compared with about 13 per cent for ECCE (Acar et al. J Cat Ref Surg 2011 Aug; 37:1512-1516).

“In eyes with endothelial disease, there is certainly more impact, but again it is about the same in phaco and in ECCE,” Prof Kruse said.

Implications for surgery The fragility of the diseased endothelium and the high potential for comorbidities have several implications for cataract surgery technique and timing, Prof Kruse said. For Fuchs’ dystrophy in particular, he recommended placing incisions peripherally to avoid damaging the central cornea, where endothelial damage is concentrated. A viscoelastic should be used to protect the endothelium. Following capsulorhexis, Prof Kruse advised looking for dislocation of the capsule. A lot of these patients may suffer from other pathologies like pseudoexfoliation syndrome and might need some iris retractors to hold the capsule, he explained.

With a hard nucleus, Prof Kruse recommended a peripheral approach and manually dividing the nucleus as much as possible, saving phaco for the end of the procedure. A high viscosity viscoelastic should be used to protect the endothelium, and trypan blue can help visualise the cortex for these patients. He suggested using phaco to make one groove to divide the lens. Enlarging the incision allows a very hard lens to be extracted with forceps without harming the endothelium. Viscoelastics should be used on top of the lens to protect the endothelium during extraction, and can also be used to help express the lens.

As for timing, “the big question is: should we perform a cataract surgery or should we perform a triple,” Prof Kruse said.

With PK, many studies suggest there is no difference in terms of visual acuity, astigmatism, central refraction or variation of correction between a classic triple and phaco following PK, Prof Kruse noted. However, visual results are poor, with best-corrected vision typically in the 20/60 range, with refraction varying from -10.0 D to +10.0 D. This might argue against combining the procedures when possible, except most patients develop cataract after PK, so the triple may be easier on the patient.

Substituting Descemet’s-stripping automated endothelial keratoplasty (DSAEK) for PK – the “new triple” – significantly lowers risk. But visual outcomes are still hard to predict because the lamellar stroma attached to donor tissue changes the curvature of the posterior cornea.

Prof Kruse recommended the “newest triple,” which uses DMEK. DMEK differs from DSAEK in that no lamellar stroma is removed with the donor cornea, which eliminates the hyperopic shift often seen with DSAEK. It also results in stable endothelial cell counts three months after surgery, making the combined surgery an attractive option for avoiding a second surgery for cataract patients whose endothelial disease might otherwise progress (Kruse et al. Cornea 2011; 30(5):580-587).

Prof Kruse described a step-wise procedure for reliably preparing donor tissue and inserting it using an IOL injector and air bubbles to unfold the graft and hold it on the posterior cornea. He recommended performing DMEK after normal phaco, using an IOL with plate haptic to maintain stability of the capsule, which is stressed by the placement of the graft. Removing the epithelium and using methylcellulose can help improve visibility through clouded corneas.

Visual outcomes are nearly stable at three months and improve out to six months. In 80 cases Prof Kruse examined, mean best-corrected visual acuity was better than 20/30. Many patients reach 20/20 after surgery, he said.