R efRACTIVE surgeons have an ever increasing array of strategies at their disposal for the correction of astigmatism and anisometropia following keratoplasty procedures, said Rudy M M A Nuijts MD, PhD, Oogziekenhuis Maastricht UMC, Maastricht, The Netherlands, at the XXIX Congress of the ESCRS.

Penetrating keratoplasty (PKP) is in general a very successful procedure in terms of transplant survival although post-keratoplasty anisometropia and high astigmatism remains a big problem, Dr Nuijts noted.

In patients with endothelial disease, surgeons can avoid the refractive problems by opting for endothelial keratoplasty procedures, but around 30 per cent of patients undergoing PKP or deep anterior lamellar penetrating will have more than five dioptres of anisometropia and astigmatism.

In 20 to 40 per cent of penetrating and deep anterior lamellar keratoplasty (DALK) cases the anisometropia and astigmatism are severe enough as to require contact lenses. However, 30 to 40 per cent of such patients cannot tolerate contact lenses. The surgical options in such cases include relaxing incisions, wedge resections, excimer laser treatments, or lenticular options such as phakic and pseudophakic toric IOLs, he said.

Incisional approaches unpredictable  Incisional approaches such as relaxing incisions, can correct an average of four to five dioptres of post-keratoplasty astigmatism, and their anti-astigmatic effect is proportional to the preoperative cylinder. Published studies show that arcuate keratotomy can correct 45 per cent to 72 per cent of the astigmatic refractive error. However, the technique can have unpredictable results and it has minimal effect on spherical equivalent. Furthermore, in some cases the incisions can lead to perforations and graft rejections.

Dr Nuijts noted that in theory femtosecond lasers offer greater precision and predictability in the creation of relaxing incisions. However, in practice the results of arcuate keratotomy with the femtosecond laser have been similar to those achieved with manually created incisions.

Wedge resections are another alternative for correcting post-keratoplasty astigmatism, although they have been somewhat less popular due to their difficulty and lack of precision. Femtosecond lasers may bring the technique into greater favour since they may make it both safer and more effective, given the ease-of-use and precision they afford.

Surface ablations less risky than LASIK  Like wedge resections, surface ablations have also had their safety issues but have become safer with the use of improved technology and pharmaceutical interventions. In some early reported case series, PRK reduced post-keratoplasty astigmatism by 38 per cent to 57 per cent. However, it also resulted in moderate to severe haze accounting for loss of more than two lines of BCVA in up to 40 per cent of cases in some studies.

More recent research indicates that much better results can be achieved using lasers with customised ablation profiles and mitomycin-C. For example, in a study involving 16 eyes with post-keratoplasty astigmatism, topography-assisted wavefront-guided LASEK with a flying 0.8mm spot excimer laser (Eisiris, Schwind, Germany) reduced mean astigmatism from -7.2 D to -2.7 D. In addition, among four eyes treated with mitomycin-C there was only trace haze in one eye and no haze in three eyes.

By contrast, among 12 eyes that did not receive mitomycin-C there were three cases of haze grade II to IV, Dr Nuijts noted. The LASEK and PRK appear to be equally safe and effective in reducing astigmatism after keratoplasty.

LASIK is another alternative for post-keratoplasty astigmatism. Published studies show it can reduce cylinder by 48 to 76 per cent. However, in a selection of patients there has been a high proportion of complications that necessitated repeat keratoplasty procedures. Moreover, in some series a significant number of eyes lost two lines of vision.

Toric phakic IOLs are another technology that seems to have great potential but comes with its caveats, Dr Nuijts noted. In a study he and his associates conducted involving 57 patients with post-keratoplasty astigmatism, implantation of a toric Artisan/Verisyse anterior chamber IOL (Ophtec/AMO) reduced mean sphere by 100 per cent and mean cylinder by 86 per cent, and BCVA was 20/40 or better in 84.2 per cent of eyes. However, at four years’ follow-up there were significant reductions in endothelial cell count, with the mean value falling from 1666/mm² preoperatively to 861/mm². On the other hand, the rate of loss is similar to what occurs in PKP patients without the lenses in many case series.

Meanwhile, posterior chamber phakic IOLs can provide similar results and do not appear to pose any danger to the endothelium because of their position in the posterior chamber. In a study involving 13 eyes with post-keratoplasty myopia and astigmatism, implantation of the Staar ICL reduced mean sphere from -7.1 D to -0.95 and astigmatism was 1.0 D or less in all eyes, compared to mean of -3.5 D preoperatively. Furthermore, mean UCVA was 0.51 and mean BCVA was 0.79 (Alfonso et al, J Cat Refract Surg 2009; 35:1166).

For keratoplasty patients who also have cataracts there are now a broad range of toric IOLs available composed of silicone, hydrophobic acrylic and hydrophilic materials. The Lentis mplus (Oculentis) IOLs can correct 0.5 D to +12.0 D of cylinder. The Acrysof toric lens and the Tecnis (AMO) toric lens can correct +1.5 to 6.0 D and +1.0 D to 4.0 D of cylinder, respectively.

“Toric IOLs are useful in eyes with cataract with post-keratoplasty astigmatism, although repeat keratoplasty at a later date can negate some of their benefit.”

Dr Nuijts noted that in theory toric phakic IOLs are useful in eyes with cataract with post-keratoplasty astigmatism, although repeat keratoplasty at a later date can negate some of their benefit.

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