THE USE of a Barron artificial anterior chamber (Katena Products, Inc) results in safer and more efficient surgery for deep lamellar endothelial keratoplasty (DLEK) procedures, according to Pavel Studeny MD.

Speaking to delegates at the first Cornea Day organised as part of the 10th ESCRS Winter Refractive meeting, Dr Studeny said that the Barron device successfully addresses some of the problems often associated with lamellar surgery such as long duration, difficult lamellar preparation and poor control of intraocular pressure.

"We have used this device successfully in a number of patients now and are satisfied with the level of safety and control that it gives us over traditional lamellar keratoplasty approaches," said Dr Studeny, Nemocnice Sokolov Hospital, Czech Republic.

The Barron artificial anterior chamber is designed to safely facilitate the positioning, securing and inflating of the donor cornea (14mm-18mm) during corneal transplant and lamellar surgery procedures, said Dr Studeny. The artificial chamber allows the surgeon to cut the donor cornea from the epithelial side, the same direction as the recipient’s cornea is cut, producing a more perfect donor-to-host match and helping to reduce surgically induced astigmatism.

“Our initial results have been very positive and our clinical experience shows that the Barron artificial anterior chamber is very useful for lamellar disc preparation” Pavel Studeny MD

Designed in a bright blue colour to provide a high contrast background for visualising the cornea, the chamber is comprised of three main components: a base with tissue pedestal, tissue retainer and locking ring. The base has two ports with silicone tubing, in-line pinch clamps and female Luer-Lok connectors. Either port may be used to inject or aspirate viscoelastic, balanced salt solution (BSS) or air. The device is also sterile and disposable for convenience.

Describing DLEK as the transplantation of posterior lamellar disc including posterior stroma, Descemet’s membrane and endothelium, Dr Studeny said the goal of such surgery is to replace damaged or dysfunctional corneal endothelium. The main indications are pathologies such as Fuchs’ endothelial dystrophy and pseudophakic or aphakic bullous keratopathy, he said.

According to Dr Studeny, there are several main advantages in using the Barron device.

“For a start the surgery is much easier and safer and also more precise because we can better control the pressure in the anterior chamber. It has also reduced the need to use cadaver eyes because we can now use the corneas provided by the eye bank. And finally, it has reduced the waiting time for patients and allows us to carry out a detailed examination of the cornea prior to grafting,” he said.

Promising early results

To illustrate the effectiveness of the device, Dr Studeny presented a case history of his first patient who underwent DLEK using the artificial chamber. The male patient was diagnosed with pseudophakic bullous keratopathy after phacoemulsiﬁcation in 2004 and his best-corrected visual acuity was reduced to hand movement only. After the corneal graft, his BCVA improved to 0.7 with an endothelial cell density of 1,389 cells/mm².

“Our initial results have been very positive and our clinical experience shows that the Barron artificial anterior chamber is very useful for lamellar disc preparation,” concluded Dr Studeny.

In a discussion at the end of the session on lamellar keratoplasty, Joseph Colin MD queried whether the artificial chamber could be used in conjunction with a microkeratome or whether a spatula was the only instrument that could be used to dissect the lamellar. Dr Studeny responded that he only had experience working with the spatula.

Sadeer Hannush MD remarked that special care must be taken concerning the diameter size of the donor cornea to be used with artificial anterior chambers.

“In my experience, a minimum diameter of about 16mm is needed to create a good seal around the artificial chamber before you try to take off a 300 micron cap,” said Dr Hannush, attending surgeon, Cornea Service, Wills Eye Hospital, and assistant professor of ophthalmology, Jefferson Medical College, Philadelphia.

Dr Hannush said that many surgeons in the US are now converting to a refined version of posterior lamellar surgery called Descemet’s stripping automated endothelial keratoplasty (DSAEK or simply DSEK) for pathologies such as Fuchs’ endothelial
dystrophy and bullous keratopathy. Instead of freehand dissection, Dr Hannush said he uses the automated Moria ALTK system, which combines an artificial chamber and a microkeratome, to cut the donor lamella to the desired thickness. The diameter is then determined by a donor punch (usually 8.5 - 9.0mm).

The advantage of such an approach is that compared to standard penetrating keratoplasty, it results in minimal refractive change and provides more rapid visual recovery for patients with endothelial dysfunction. In addition, the surgery is considered safer as the new cornea is inserted through a small incision of about 5.0mm or less. The technique also maintains the structural integrity of the cornea by preserving the recipient's epithelium, Bowman's layer and entire stromal thickness.

The current downside to such an approach, said Dr Hannush, is the significant rate of displacement of the grafted tissue in the immediate postoperative period (5-15%), requiring further surgical intervention, albeit minor, for re-attachment (placing another air bubble in the anterior chamber behind the graft). He surmised that viscoelastic left in the interface may help to explain the current high rate of dislocations found in the 24-hour period after surgery, but said that further studies were needed to shed light on this problem.

He said that while there was undoubtedly an initial steep learning curve for surgeons who make the transition from penetrating keratoplasty, the outcomes ultimately justified making the move towards DSAEK.

"For surgeons who are converting to this technique, I would strongly recommend they start with simple cases such as pseudophakes with posterior chamber implants in the bag, no areas of zonulysis or vitreous prolapse. In these cases the success rate will be very high because the air bubble that is put in will be retained until the surgeon decides to release it. For those patients who retain the corneal button on the first day, the results are really spectacular and they typically regain vision in a very rapid manner, which is a distinct difference from the longer visual rehabilitation associated with full thickness corneal transplant," he said.