Intrastromal corneal ring has benefits in penetrating keratoplasty

The intrastromal corneal ring (ISCR) appears to be a useful adjunct for improving the outcomes of penetrating keratoplasty (PKP), reported Jörg H Krumeich MD, at the XXIII Congress of the ESCRS.

Two-year data from a prospective study comparing 268 consecutive eyes that underwent PKP with the ISCR and 285 consecutive eyes having conventional PKP without the device show that while the ring may slightly improve cylinder stability by protecting against deformation, its use had no effect on mean best-corrected visual acuity, cylinder or endothelial cell loss.

"The ISCR was intended to absorb power vectors to eliminate uneven forces on the transplant, and therefore, we were a little disappointed to find no difference in astigmatism or BCVA between eyes with and without the ring after two years. However, the ring does appear to improve cylinder stability because it acts as a circular protective wall to secure the transplant and protect it against deformation," commented Dr Krumeich, from Clinic Krumeich in Bochum, Germany.

The ring was also found to inhibit growth of superficial vessels into the transplant and has appeared to reduce the rate of immune reactions. Among eyes with the ISCR, the total incidence of immune reactions through five years is 1.8% with three of the cases occurring within the first six months and the other two developing over the next 18 months.

In contrast, the immune reaction rate among the no-ring eyes was 5%, with five cases occurring during the first six months after PKP, six more presenting between six and 12 months and the remaining three developing over the next two years. Results of a Kaplan-Meier survival analysis showed a trend for a benefit of ISCR implantation for reducing the immune reaction rate (p = 0.09), said Dr Krumeich.

"The ring protects the donor tissue from vessel-in-growth, a complication that is especially feared by cornea transplant surgeons and most strikingly, it appears to reduce the risk of immune reactions with a difference in immune reaction rates between groups is not
Corneal dystrophy was the most common indication (30%), followed by corneal scars (13%) and keratoconus (15%).

Two-year data was available for about half of the eyes in the no-ring group and almost a quarter of the eyes that had PKP with the ring. Analysis of their outcomes showed that the ring and no-ring groups were similar with respect to mean BCVA (0.53 and 0.49, respectively), mean endothelial cell count (1647 and 1600 cells/mm², respectively) and mean cylinder (-2.96 D and -2.86 D, respectively). However, cylinder during the first two years was somewhat more stable in the group receiving the ISCR.

**Halting vessel ingrowth**

Dr Krumeich illustrated the benefit of the ISCRS for stopping superficial vessel in-growth with several photographs, including a case involving a patient with xeroderma pigmentosum who was doing well four years post-PKP.

"Most cornea surgeons are reluctant to perform PKP in patients with xeroderma pigmentosum because of the multiple ocular surface problems in these eyes, but my experience in this case using the ISCR has been favourable. Because it acts as a barrier to vessel growth, I have also started to use this technique as an adjunct in eyes undergoing pterygium excision, placing a segment of the ring lateral to the pterygium, toward the central cornea. However, it is too early to tell if that approach is effective for preventing pterygium recurrence," he said.

**Technique explained**

The ISCR is made of a cobalt-titanium-molybdenum alloy, measures 8.0mm in diameter, and is 0.15mm thick. When placing the ISCR in eyes undergoing PKP, the host tissue is cut using the Guided Trephine System (GTS) developed by Dr Krumeich. Use of that particular device is critical because it creates an undercut that is very even and symmetrical.

"Placement and suturing of the ring in eyes undergoing PKP is not a very technically demanding procedure, and using the GTS assures that the ring will fit evenly into the wound site," Dr Krumeich explained.

After trephination, the graft is placed into the bed and two single interrupted sutures are put graft to host at 6 and 12 o'clock. Then the ring is laid into the cut and both SIS are knotted. Next, two more single interrupted sutures are placed at the 9 and 3 o'clock positions and knotted before the double-running anti-torque suture is performed. The ring automatically lies in the upper third of the host-graft interface because of its dimensions.

"Rounding of the cornea dome is extremely easy once the ring is in place, and if the sutures pull through after surgery and the patient is more than two months post-op, the sutures may not even need to be redone since wound healing is faster in eyes that have had the ring placed," Dr Krumeich said.

The ring itself can be left in permanently. The alloy from which it is constructed is highly biocompatible. It leaves no deposits in the cornea, nor does it cause any defects within the corneal tissue.

In addition to placing the ring primarily at the time of PKP, Dr Krumeich noted it could be implanted as a secondary measure to correct astigmatism in an eye that has already had PKP. Under keratoscopic control, the ring is compressed along the flat axis using a pull-push instrument on one side and a sponge on the opposite side. The ring may be reshaped thereby from circular to oval. This technique can correct up to 6.0 D of astigmatism.

"The ISCR is a promising new tool for addressing the postoperative astigmatism problem," he said.

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