New iris ring useful for cataract cases with small pupils and weak zonules

Boris Malyugin

A NEW pupil expansion ring can greatly facilitate phacoemulsification in eyes with small pupils, including those with weak zonules, according to the device’s developer, Boris Malyugin MD PhD, S Fyodorov Eye Microsurgery Complex, Moscow, Russia.

The pupillary ring uses the scroll principle to capture and expand the iris margin. The device is composed of 5-0 polypropylene and is square in shape. It has corners twisted into loops that clasp the edge of the iris and enable the surgeon to stretch the pupil to a width of 6.0mm, with less trauma to the iris than occurs with conventional non-pharmacological techniques, Dr Malyugin told the XXV Congress of the ESCRS.

"I use it in all cases of small pupil during phaco including floppy iris syndrome. At the end of the procedure it is removed from the eye. The decision of whether or not to implant the capsular ring as well depends on the laxity of the zonular apparatus of the lens."

In addition, in eyes with zonular weakness the design of the ring also makes it possible to temporarily clamp the edge of the anterior capsulorhexis to the pupillary margin, simultaneously providing a large pupillary aperture and zonular support, Dr Malyugin said. "With this manoeuvre we attach the capsule to the iris thus creating artificial zonular fibres and artificial zonular support. When the capsular bag is suspended with the ring you can perform safe phaco with a chop or whatever technique you will prefer and you can be sure the capsular bag will stay in place."

Small pupils a thorny problem

Dr Malyugin noted that cataract surgery in eyes with small pupils can present a considerable challenge. Such cases carry a fairly high risk of complications such as failed capsulorhexis, posterior capsule rupture, vitreous loss, dropped nucleus, endothelial cell loss and asymmetrical IOL fixation. The surgical difficulties occasionally require surgeons to convert from phacoemulsification to extracapsular cataract extraction.

Among the most common causes of small unresponsive pupils are advanced patient age, glaucoma with miotic therapy, pseudoxefoliation syndrome, diabetes, uveitis, trauma and previous surgery. The difficulty of such cases can be further compounded by the presence of weak zonules.

There are numerous techniques for expanding pupils in cases where pharmacological agents fail, including synechiolysis, mechanical stretching with Sinskey hooks, and pupillary membranectomy. However, such techniques are often themselves inadequate and can cause long-term damage to the functionality and cosmetic appearance of the pupil.

It was for these reasons that Dr Malyugin first developed his iris expansion ring nearly seven years ago. Since that time the device has undergone several design modifications and it is approved for use in Russia. More recently the American manufacturer MST has become involved in further developing the device and marketing it in other countries. It has also introduced a new instrument for inserting and removing the ring.

"The inserter works very well and implantation of the ring as well as the removal is much more convenient," Dr Malyugin told EuroTimes.

Dr Malyugin generally inserts the ring at the beginning of the phacoemulsification procedure, placing the device through an enlarged 2.2 to 2.8mm clear corneal incision and positioning it in the centre of the pupillary aperture. He then gently pushes at each angle of the ring with a Sinskey hook to trap the iris in the four curls. Once in place, the ring expands the pupillary opening to 6.0mm. "The ring provides stable mydriasis with no trauma to the iris tissue and no need for additional paracenteses. It retracts the iris away from the flow currents and thus helps to prevent its incarceration into the ultrasound and irrigation aspiration handpieces. As a result of the ring implantation we obtain a square, 6.0mm pupil dilation that allows for safe and comfortable manoeuvres during phacoemulsification," he said.

Dr Malyugin noted that the device has been used in over 500 procedures in Russia. In addition, clinical trials have shown that it performs as well as, if not better than, conventional pupil stretching in terms of both safety and efficacy.

In a study involving cataract patients with small pupils unresponsive to conventional pupil dilation techniques, there were fewer surgical complications in 27 eyes managed with the pupil expander ring than in 32 eyes managed with iris hooks and there were comparable outcomes in both groups.

The two treatment groups were similar with regard to nucleus density and ocular co-morbidities, including uveitis, glaucoma and diabetes. In all cases Dr Malyugin and his associates were unable to achieve sufficient mydriasis after synechiolysis and iris stretching. They performed all surgical procedures with 2.2mm incision coaxial MICS using Millennium Custom Control software (Bausch & Lomb).

There were three cases of hyphaema in the control group, compared to only one in the iris ring group. Furthermore, in the control group there were five cases of fibrinoid reactions and seven cases of early postoperative IO P spikes. By comparison, in the iris ring group there were only two fibrinoid reactions and one case of postoperative IO P. Moreover, endothelial cell loss six months postoperatively was only 7.6 per cent in the iris ring group, compared to 9.1 per cent in the control group.

The lower incidence of complications in the group implanted with the pupil expansion ring suggested that the device induces less intraocular trauma than conventional iris hooks, Dr Malyugin noted. In addition, while final best-corrected visual acuity was similar in the two groups, it was slightly better at one day and one week after surgery in the group managed with the iris ring.

"Intra- and postoperative complications were comparable and even less in the group of patients where the pupil ring was used. Our clinical study clearly demonstrates superior endothelial cell protection, decrease of hyphaemias, fibrinoid reactions and early postoperative hypertension in the study group," Dr Malyugin said.

Good results in eyes with weak zonules

Dr Malyugin told the Stockholm congress that he has also achieved good results with the ring in eyes with small unresponsive pupils further complicated with weak zonules. In such patients he uses his modified technique for clamping the pupillary margin to the edge of the anterior capsulorhexis.

He described his results in 19 cataract patients with small pupils and weak zonules. The patients had a mean age of 68.1 years and their cataracts had a mean nucleus density of 2.7. All had ocular co-morbidities, including glaucoma in nine cases, pseudoexfoliation in seven cases, diabetes in one case and uveitis in two cases.

There were only minor surgical complications in the study and all were resolved during the early postoperative period. They included iritis in one eye, a transient increase in intraocular pressure in three eyes, and micro-hyphaema in one eye. In general, the effect of the surgery on IO P and endothelial cell loss was comparable to that observed in normal cataract cases. The mean IO P was 17.9 mmHg pre-operatively and 19.2 mmHg postoperatively (the difference was not statistically significant).

Visual rehabilitation was also rapid in most eyes. BSCVA stabilised in 70 per cent at one day, in 85 per cent at one week and 90 per cent at three months.

The mean operation time for the procedures was 29.6 minutes, the mean ultrasound time was 19.4 seconds and the mean ultrasound power used was 16.1 per cent. The mean volume of irrigation fluid required was 92.3ml.

"The iris capsule ring sandwich allows for secure stabilisation of the lens bag during the surgery. The fixation of the lens bag to the capsulorhexis margin is strong enough to withstand the mechanical stress during phaco. The technique is also capsule friendly, no radial tears were observed. The long-term stability of the capsular bag-IOL complex in these cases is an issue to be further evaluated because of the capsular phimosis to which these eyes are more prone," Dr Malyugin concluded.

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