LASER CATARACT SURGERY IN PEDIATRIC PATIENTS

Children are not little adults.

BY H. BURKHARD DICK, MD, PHD

In medieval and early modern art, children are sometimes depicted as small-scale adults, with the same bodily proportions and frequently with a knowing, if not to say sad, expression on their oddly mature faces. In New York City's Metropolitan Museum of Art, Berlinghiero's *Madonna and Child* is an outstanding example of this particular artistic conception, but as no lesser an institution than the World Health Organization has unequivocally stated, "Children are not little adults."[1] Perhaps no one is as aware of this fact as the ophthalmic surgeon. The infant eye reacts very differently to the trauma of surgery than the adult eye: the former is much more susceptible to postoperative inflammation and problems in wound healing. Operating on an infant just a couple of weeks or months old means interfering with the status of an eye that will experience rapid growth—and with it a rapid shift in refraction—over the first 18 months of the child's life.

These patients deserve the best care we can offer. In my clinic, our experience with almost 5,000 laser cataract operations in adults convinced us that, for many infants, performing the capsulotomy—one of the most crucial steps of the entire procedure—with the laser might be the right thing to do (as an off-label procedure, like so many surgical interventions in the infant eye).

LASER CAPSULOTOMY MAKES SENSE

My colleagues and I described performing pediatric cataract surgery with the laser in 2013 and have so far operated on 55 children.[2] In a few of the very first cases, a lateral superficial cantholysis had to be performed to allow the docking of the interface to a globe that is significantly smaller than an adult's. In the meantime, one manufacturer has introduced a smaller liquid optic interface especially for patients with tight palpebral fissures (Catalys Precision Laser System; Abbott Medical Optics); this interface measures only 12 mm in diameter. The procedure of docking, scanning, and initiating the laser capsulotomy is very similar to what we do in elderly patients, although some of the treatment data are a bit different. The incision depth varies from 400 to 1,000 µm, and pulse energy is set between 4 and 10 µJ. The intended diameter of the anterior capsulotomy is between 3.3 and 5.2 mm, and for the posterior capsulotomy, the diameter is between 3.2 and 4.7 mm. We have found that, particularly in very young children, the capsulotomy's diameter tends to turn out larger than planned. To correct for that aberration, we developed what is now known as the *Bochum formula*.[3]

> **"We consider it highly advantageous to remove the lens and implant the IOL in the same room as the laser procedure."**

THE PROCEDURE

We consider it highly advantageous to remove the lens and implant the IOL in the same room as the laser procedure to minimize the risk of infection and other complications.[4] It is safe, convenient, and efficient to rotate the patient under the operating microscope after laser capsulotomy and continue with the more conventional part of the procedure. Two sideport incisions are created manually with a paracentesis knife; the anterior chamber is stabilized with an ophthalmic viscosurgical device (OVD) such as Healon 1.0% (Abbott Medical Optics). In most cases, we use the dimple-down technique: a slight centripetal pressure on the capsule leads to the separation of the few potential remaining tags, and the anterior capsulotomy becomes completely free.[5] The lens and cortex are removed with a bimanual I/A device (Geuder). Next, it is back under the laser. Redocking is followed by the posterior capsulotomy. The final step takes place under the microscope again.

In children younger than 2 years, we perform an anterior 23-gauge vitrectomy through the paracentesis and then close the incisions with 11–0 nylon sutures. In children older

than 2 years, the OVD is again injected into the anterior chamber, and an IOL, like the bag-in-the-lens IOL, is implanted. After lens implantation, the OVD is removed bimanually using I/A handpieces, and the incisions are hydrated or closed with an 11–0 nylon suture if necessary.

The operation is the first step to visual recovery for a child with a cataract, to be followed by long-term care provided by the ophthalmologist. The parents (or caretakers) must be educated about the need for continuous follow-up so that complications like inflammation, glaucoma, and postoperative capsular opacification can be detected and treated as soon as they arise, refractive errors can be corrected, and amblyopia therapy can be pursued. In the immediate postoperative stage, the parents must administer pharmacological therapy as recommended by the surgeon or the ophthalmologist in charge of follow-up. Normally, three different kinds of drugs are instilled as eye drops: antibiotics, anti-inflammatory agents, and mydriatics/cycloplegics.

THE QUESTION OF APHAKIA

A crucial point comes in the midst of the operation. After the laser has completed its mission and the surgeon has removed the lens, he or she is faced with a decision that may have momentous consequences for the young patient: should an IOL be implanted, or should the eye be left aphakic? The Infant Aphakia Treatment Study (IATS) followed up on more than 110 children who underwent cataract surgery during early infancy and demonstrated significantly more adverse effects in the IOL group. Additional surgical procedures to clear opacities in the visual axis were necessary in 68% of eyes with an IOL versus just 14% of eyes left aphakic. Seen the other way around: 79% of eyes that were corrected by contact lenses after cataract surgery did not require additional intraocular surgery, but only 28% in the IOL group were that lucky.[6] The IATS group concluded, "When operating on an infant younger than 7 months of age with a unilateral cataract, we recommend leaving the eye aphakic and focusing the eye with a contact lens."[7] Irrespective of using the femtosecond laser or performing conventional pediatric cataract surgery, we could not agree more.

> "Pediatric patients, the youngest the cataract surgeon cares for, are special."

CONCLUSION

Pediatric patients, the youngest the cataract surgeon cares for, are special. They are not small adults, and it is not just the infant eye we should have in mind when we ponder our strategy. Many children will undergo cataract surgery within the first months of their lives. The prospect of another operation under general anesthesia—maybe even under prolonged anesthesia—because opacification of the visual axis has developed should not be taken lightly. This is a phase in life of rapid development and differentiation of some of the most delicate features of the human central nervous system, a period of highly sensitive changes in a child's cognitive abilities. If ophthalmologists can spare that child another exposure to general anesthetics, they should pursue this course. It is probably not only the function and well-being of the eye that are determined by pediatric cataract surgery but also the health of the entire visual-cerebral complex. What cataract surgeons do and how well they do it will have consequences for an entire lifetime. ■

AT A GLANCE

- The infant eye reacts very differently to the trauma of surgery than the adult eye: the former is much more susceptible to postoperative inflammation and problems in wound healing.
- We consider it highly advantageous to remove the lens and, if reasonable, implant the IOL in the same room as the laser procedure to minimize the risk of infection and other complications.
- If ophthalmologists can spare that child another exposure to general anesthetics, they should pursue this course. It is probably not only the function and well-being of the eye that are determined by pediatric cataract surgery but the health of the entire visual-cerebral complex.

1. Training for the Health Sector. www.who.int/ceh/capacity/Children_are_not_little_adults.pdf. Accessed March 22, 2016.
2. Dick HB, Schultz T. Femtosecond laser-assisted cataract surgery in infants. *J Cataract Refract Surg*. 2013;39:665-668.
3. Dick HB, Schelenz D, Schultz T. Femtosecond laser-assisted pediatric cataract surgery: Bochum formula. *J Cataract Refract Surg*. 2015;41:821-826.
4. Dick HB, Gerste RD. Plea for femtosecond laser pre-treatment and cataract surgery in the same room. *J Cataract Refract Surg*. 2014;40:499-500.
5. Arbisser LB, Schultz T, Dick HB. Central dimple-down maneuver for consistent continuous femtosecond laser capsulotomy. *J Cataract Refract Surg*. 2013;39:1796-1797.
6. Plager DA, Lynn MJ, Buckley EG, et al. Complications in the first 5 years following cataract surgery in infants with and without intraocular lens implantation in the Infant Aphakia Treatment Study. *Am J Ophthalmol*. 2014;158:892-898.
7. Infant Aphakia Treatment Study Group, Lambert SR, Lynn MJ, Hartmann EE, et al. Comparison of contact lens and intraocular lens correction of monocular aphakia during infancy: a randomized clinical trial of HOTV optotype acuity at age 4.5 years and clinical findings at age 5 years. *JAMA Ophthalmol*. 2014;132:676-682.

H. Burkhard Dick, MD, PhD
- director and chairman, University Eye Hospital, Bochum, Germany
- member, *CRST Europe* Editorial Board
- burkhard.dick@kk-bochum.de
- financial disclosure: consultant to Abbott Medical Optics