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When a child has cataracts

Unlike in adults, cataract surgery in pediatric patients is rare and complicated. Here's what you need to know.

By Kate Goldblum, MSN, CNP

Cataracts are common in older adults, and cataract surgery is one of the most frequently performed surgeries for Medicare beneficiaries in the United States. Routine use of intraocular lenses has made visual rehabilitation rapid and uncomplicated for most patients.

In contrast, cataracts in children are much less common, and surgical correction is complicated by a number of issues specific to this population. In addition, visual rehabilitation involves much more than simply removing the cataract and correcting the postoperative aphakia (or absence of the lens). This article explores the issues in providing nursing care to children having cataract surgery.

Focusing on the lens

Although many patients think of a cataract as something that grows in their eye, a cataract is simply an opacity that develops in the crystalline lens. The function of the lens is to refract, or bend, light rays as they enter the eye so they focus in a fine point on the retina, producing a clear image. Cataracts compromise the optical function of the eye by disrupting normal light refraction through the lens to the photoreceptors

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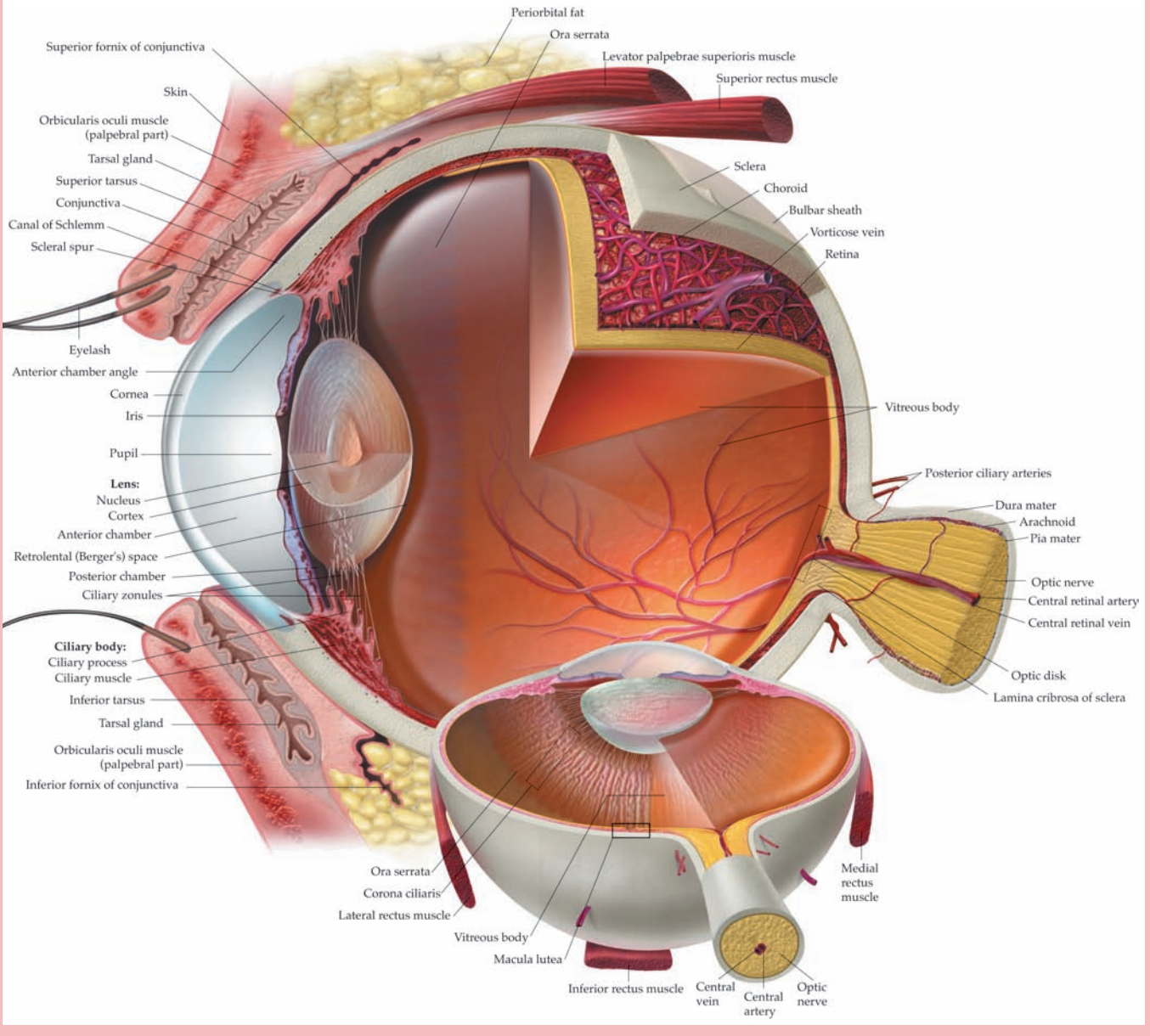
of the retina. Removal of the cloudy lens during cataract surgery results in aphakia and requires a replacement lens.

Anatomically, the lens is located between the iris and the vitreous body, and is attached to the ciliary process by the ciliary zonules (see *Ocular anatomy*). The lens consists of three primary structures. The outermost layer is the capsule, which surrounds the underlying cortex. The innermost part of the lens is the nucleus. A cataract can develop in the cortex (*cortical* cataract), the nucleus (*nuclear* cataract), or adjacent to the capsule (*subcapsular* cataract) (see *Cross section of the lens and nuclear and cortical cataracts*). Subcapsular cataracts may be located adjacent to either the posterior or

Ocular anatomy



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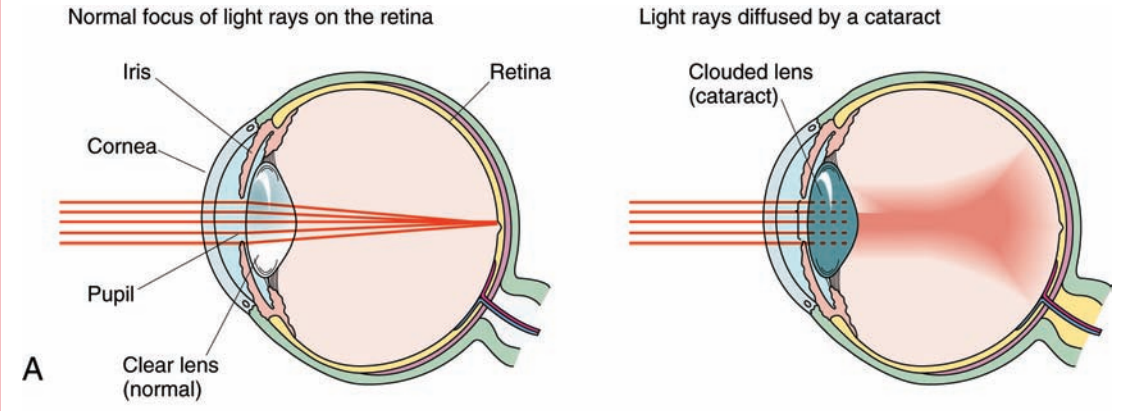
How cataracts affect vision



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anterior aspect of the capsule (*anterior subcapsular* or *posterior subcapsular* cataracts).

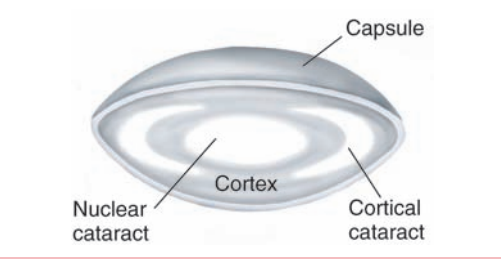
How cataracts develop

Disruption in the normal metabolism of the lens causes changes that lead to opacities in this normally clear optical structure.[1] Cataract formation can occur for many reasons. In adults, aging is the most common cause. Risk factors include smoking, diabetes, hypertension, obesity, corticosteroid use, UVB exposure, other radiation exposure, and ocular trauma. Cataracts in infants and children may be idiopathic or associated with another disorder, such as intrauterine infections during fetal development, metabolic disorders, other ocular diseases, inherited disorders, radiation, inflammation, ocular trauma, or corticosteroid therapy.[2]

Varying degrees of cognitive or physical developmental delay can be factors in many of these conditions, resulting in other significant impairments.

In adults, about 39% of men and 46% of women will have visually significant cataracts by age 75, but the reported incidence in children is much lower, about 2.49 cases in 10,000 live births.[2,3] About a third of cataracts present congenitally or, in children under age 12, are inherited.[4] Although the systemic disorders often associated with infantile and childhood cataracts are beyond the scope of this article, remember that parents are often facing many other potentially serious health issues with their child in addition to visual impairment from the cataract.

Cross section of the lens and nuclear and cortical cataracts



Source: Bickley LS, Szilagyi PG. *Bates' Guide to Physical Examination and History Taking.* 8th ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2003.

Recognizing and diagnosing the problem

The primary clinical symptom of cataracts is blurred vision, but young children may not recognize or be able to verbalize decreased vision (see *How cataracts affect vision*). Identifying poor vision in infants requires special assessment skills unless the vision loss is profound. If the child's cataract causes significant visual impairment, the parents or other individuals who interact closely with the child may recognize signs of decreased vision. For example, an infant may not look at objects or respond to visual stimulation; an older child may hold objects very close to see them, or frequently bump into objects, trip, or even fall. In cases of mild-to-moderate vision loss, the presence of a cataract in a child may not be

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apparent until a well-child visit or during vision screening. The American Academy of Pediatrics, in conjunction with the American Association of Certified Orthoptists, the American Academy of Pediatric Ophthalmology and Strabismus, and the American Academy of Ophthalmology, has published vision screening guidelines that recommend assessment for eye problems in all newborns and continued assessment at each subsequent well-child visit. The policy also states that all children found to have an ocular abnormality or who fail vision assessment should be referred to a pediatric ophthalmologist or another eye care professional trained to treat children.[5]

Cataracts in children under age 10 can lead to amblyopia, which can't be corrected with glasses.

The most prominent clinical sign of a cataract is leukocoria–a white pupil. This occurs when the cataract is very opaque, becoming visible through the pupil. During an eye exam, when the clinician shines a light on the pupil, the normal red reflex is absent and the pupil appears white due to the lens opacity from the cataract. In a newborn with a significant cataract, this is often the finding that prompts referral to a pediatric ophthalmologist for further evaluation. Examination with an ophthalmoscope or slit lamp biomicroscope during a routine eye exam may reveal a previously unrecognized cataract, especially in infants or children with small or minor opacities that don't appear as leukocoria. In some cases, another ocular finding or a systemic disorder known to be associated with cataracts may prompt the evaluation for possible cataracts in children.

When is surgery appropriate?

In adults, the decision to have cataract surgery is based on whether the cataract is causing vision loss that is unacceptably compromising the person's daily functioning or quality of life. The decision-making process regarding surgery and the appropriate timing is much more complicated for children.

For children under age 10, poor visual stimulation from any cause (including a cloudy lens) can lead to amblyopia, commonly known as lazy eye and defined as a visual impairment that occurs without an obvious cause and can't be corrected with glasses. In other words, even if the original cause of vision loss is corrected (for example, a cataract is removed), the child's vision will remain compromised due to the lack of normal visual stimulation caused by the cataract during a crucial period of visual development. The 6 weeks after birth are a latent period during which the infant's visual system isn't sensitive to this deprivation.[6] However, after this initial "grace period," the infant will quickly begin to develop amblyopia that will persist even after cataract surgery unless the child gets adequate amblyopia treatment in the postoperative period. This "grace period" is typically only in children with bilateral, equally dense cataracts, and isn't really an ameliorating factor in those with unilateral cataracts.

Another reason for early surgery is that children begin to develop binocular vision (also called stereopsis) at about 3 months of age. Because good vision in both eyes is necessary for stereopsis (depth perception) development, this process can be compromised if the infant doesn't have cataract surgery.[6]

Other crucial considerations in determining the optimal timing of cataract surgery in infants or children include whether the condition is bilateral or unilateral and whether the cataract is partial or complete (see *Bilateral central cataracts*). For example, partial cataracts may affect only part of the lens and may not cause significant visual impairment. As discussed earlier, when a cataract significantly blocks visual stimulation, amblyopia can develop quickly, and in these cases the surgeon will usually operate as soon as possible after the diagnosis. In the case of a child with a partial cataract that only slightly reduces visual acuity, no surgery may be a better option. This is particularly true if the surgeon doesn't plan to insert an intraocular lens to address the resulting aphakia.

Whether to insert an intraocular lens is based on the child's age, other health issues, eye size, and whether the condition is unilateral or bilateral. Research about correction of surgical aphakia in infants with cataracts hasn't fully answered the question of whether an intraocular lens is the best

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approach. As a result, surgeons continue to evaluate the risks and benefits of intraocular lenses on an individual basis.[7]

Bilateral central cataracts

Courtesy of Brian Forbes, MD.

Caring for a surgical patient

In contrast to adults, infants and children with cataracts require very different care in the perioperative period. Nurses involved in caring for these patients must consider the common issues pertinent to all pediatric patients, such as developmental milestones, emotional responses of the child and parents, and physiologic differences. Children also may have additional health issues, and their postoperative visual rehabilitation is more complicated. In addition to the usual perioperative nursing concerns for children (which are beyond the scope of this article), consider the following areas:

Preoperative considerations. Optimal pupil dilation is imperative for successful cataract surgery. No protocol is generally accepted and the exact regimen will differ depending on the surgeon's preference. A typical combination is tropicamide 1% and phenylephrine 2.5%. The most commonly used dose is one drop of each into the operative eye every 5 minutes for three applications, 30 to 60 minutes before surgery. Although some infants and children may cooperate, many vigorously resist administration of any ocular medication.

In those cases, the best approach for both the patient and parents is a matter-of-fact, effective, and gentle restraint to quickly administer the necessary medications. Because dilating agents cause burning, the surgeon also may prescribe a topical agent that can be instilled to anesthetize the eye before instilling the dilating drops. These topical anesthetic agents often burn initially as well, but their anesthetic effect may last up to 15 minutes, making subsequent doses of the dilating drops less uncomfortable.

Postoperative intraocular infection (endophthalmitis) can be devastating, so many surgeons have patients start topical antibiotic drops 1 to 2 days before surgery and also prescribe these drops for use in the operative eye immediately before surgery.[8] Research also supports instilling povidone-iodine sterile ophthalmic solution (diluted to 5%) into the operative eye at the time of skin prep.[9] Careful surgical prep of the eyelid, lashes, and surrounding skin is also imperative.

Surgical techniques. Cataract surgery in the pediatric eye differs from that in adults in several ways.[10] First, the surgical approach is usually via the pars plicata, with the incision made about 3.5 mm posterior to the corneal-scleral junction. This approach lets the surgeon make a primary posterior capsulotomy (an opening in the posterior lens capsule). Adult patients have a much lower risk of developing posterior capsular opacification (also called a secondary cataract) at some point after surgery than do pediatric patients, who almost universally develop this condition. The primary capsulotomy performed during pediatric cataract surgery prevents this postoperative complication.[11]

Another difference with pediatric patients is that the capsule is much more elastic, making it difficult to perform the anterior capsulotomy before aspirating the lens material. Some surgeons prefer to make the capsular opening with the vitrectomy unit (vitrectorhexis) due to this increased elasticity, particularly in children under age 6. After age 6, manual continuous curvilinear capsulorhexis performed as in adult surgery is often preferable.[12]

Ultrasound power is rarely needed to emulsify the lens because the lens nucleus is quite soft in infants and children. If the child is a candidate for intraocular lens implantation, the preferred location for placement is in the capsular bag. Intraocular lens implantation is the preferred procedure for children over age 1.[12] In the future, intraocular lens implantation may become the standard of care for even the youngest patients.[7]

Surgeons routinely perform anterior vitrectomy in infants and children. The vitreous is a formed semisolid, and the postoperative inflammation that's more common and severe in children may cause the vitreous to opacify in the future if the anterior portion isn't removed at the time of cataract surgery. In contrast, adults need anterior vitrectomy only if the posterior

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capsule has ruptured and let vitreous material come forward.[13]

Sutures are more commonly used to close the surgical wound in children. Many surgeons prefer to use absorbable suture to alleviate the necessity of removing sutures in an infant or child who can't cooperate with the procedure.

Topical anesthesia for adult cataract surgery is very common and surgeons now rarely use subconjunctival injections of corticosteroid and antibiotic at the conclusion of surgery. However, subconjunctival injections continue to be routine in infants and children to help prevent postoperative infection and control inflammation. One common regimen is dexamethasone and cefazolin. In addition, at the conclusion of the procedure, most surgeons instill topical atropine to produce pupillary dilation and a topical antibiotic or antibiotic/corticosteroid combination drop to control inflammation.[7] Many surgeons also prefer to apply a protective shield or pressure patch and shield over the eye postoperatively.

Infants and children tend to have more inflammation following cataract surgery than do adult patients.

Postoperative care

Patients typically have little discomfort following cataract surgery. If needed, oral acetaminophen or ibuprofen can provide adequate pain relief. Tell the parents that the child can resume a normal diet, as there are no contraindications for oral intake. Provide information on use of eye protection and topical medications, as well as postoperative follow-up.

The surgeon will usually discharge the child as soon as the child has recovered adequately from general anesthesia. The first postoperative exam should be within 24 to 48 hours. Patients will continue to use topical antibiotics, corticosteroids, and atropine four times daily following discharge from the surgical facility. A typical regimen is to continue the atropine for a week and the antibiotic/corticosteroid for about 4 weeks following surgery. Infants and children tend to have more inflammation following cataract surgery than do adult patients and often require a longer period of drug therapy.[7] Children should continue to use a protective eye covering at night and during the day as needed. Infants who are unlikely to injure their eye often don't need a shield during the day, and some surgeons don't suggest shields at all in this age group. Older children who return to day care or school should continue to use eye protection for up to 2 weeks.

In adults, visual rehabilitation after cataract surgery is typically a straightforward process because an implanted intraocular lens replaces the function of the lens that was removed. These adult patients often need little or no further correction postoperatively. In contrast, infants and children who don't have an intraocular lens will need glasses or contacts for clear vision after surgery.

Bilateral aphakia can be corrected with glasses, but the glasses have very thick magnifying lenses, raising concerns about their proper fit, weight, and cosmetic appearance. In cases of unilateral cataract removal, glasses aren't a realistic option: The correction for the operative eye creates an image size about 30% larger than the unoperative eye, a difference the brain can't tolerate.

In contrast, postoperative correction with contact lenses is appropriate for either unilateral or bilateral aphakia because the magnification is only about 7%, a tolerable disparity. However, contact lenses pose other problems, including cost, care required, necessary skill on the part of the parents to insert and remove them, and possible intolerance.

If contact lenses are used, lens wear usually begins about a week following surgery. As soon as the child can tolerate the lenses, occlusion therapy for amblyopia is started. Covering the unoperative eye forces the child to use the other eye, helping that eye develop better vision. Parents patch the child's eye daily for up to half the time the child is awake. An alternative is to keep the patch on for all waking hours every other day.[11] Although obtaining 20/20 visual acuity in children following unilateral cataract surgery is challenging, due to the difficulties of contact lens wear and occlusive patching, good vision is a realistic goal.

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Seeing hope

Many of the techniques used in adult cataract surgery are also appropriate in children older than 6. However, by understanding the important differences in many aspects of the surgery for younger children, you can provide appropriate nursing care for these patients and their families throughout the perioperative period. **OR**

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Kate Goldblum is a nurse practitioner at the Family Eye Care and Children's Eye Center of New Mexico in Albuquerque.

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