Cataract: The Clouding of the Crystalline Lens

Cataract is the term given to the loss of transparency of the crystalline lens inside the eye. This loss of transparency can be diffuse and generalized or a small, discrete localized opacity. The optical effects of these irregularities in the normally transparent lens vary.

Visual acuity can be reduced. In early, generalized cataracts, the effect may be minimal, as if you were looking through a light fog. Color perception may become distorted as the lens material becomes increasingly yellow and hazy. As the loss of transparency increases, clarity of vision diminishes. In advanced stages, little or no light passes through the lens and the eye is essentially blind. The optical effects produced by smaller, more dense opacities are quite different. You might notice a specific area in your visual field is blocked or distorted. Vision might be quite clear at some distances and blurry at others.

Although cataracts are the leading cause of acquired blindness in the world, it also a condition very easy to remedy. Cataract surgery is one of the most common and successful surgical procedures in modern medicine. The old, damaged lens is removed and is replaced by a plastic replacement part, called an intra-ocular lens implant.

Causes of cataracts

Cataracts can occur as a common consequence of aging, may be due to hereditary factors, trauma, inflammation, metabolic or nutritional disorders or radiation, including UV from the sun. Additionally, it appears there is an association between cigarette smoking and alcohol consumption and the formation of cataracts. Certain drugs, notably oral corticosteroids taken for long periods of time tend to induce the formation of lens opacities.

Age-related

As we age, the tissue which comprises the crystalline lens oxidizes and becomes gradually less transparent. There are other degenerative processes occurring as well, including proteolysis (dissolving of lens proteins) and electrolyte imbalance (causing liquefaction of the lens fibers). Some degree of loss of transparency can usually be observed by age 55 or so and becomes common by age 65. The progression of the condition is quite variable and many people maintain very satisfactory vision even very late in life, while others experience rapid onset and noticeable degradation of vision.

There is some evidence suggesting that there is a nutritional (and certainly metabolic) cause to age-related cataracts. Antioxidant vitamins, minerals and the building blocks of proteins called amino acids precursors are though to play a role in this type of cataracts. There is as yet no medical protocol for administering these nutrients and no clear evidence as to which micro-nutrient and in what quantity may affect these lens changes. Currently under investigation are: vitamins C and E, beta-carotene, lutein and zeaxanthin (and other carotenoids), l-gutathione (one
of the building blocks of lens tissue), precursor n-acetyl cysteine (NAC) and the minerals selenium, chromium and zinc.

It appears that in some mammals, the levels of these micronutrients decreases with age and may be related to the oxidation and loss of transparency of the lens tissue. In human populations having diets consuming of high level of these nutrients from natural sources, there is a lower incidence of age-related cataracts. It is unclear whether supplementation can affect the development of cataracts. It is certainly possible that one day soon there will be a "magic pill" to help prevent this type of cataract. For now, the recommendation is to eat a diet rich in the nutrients discussed above. Sources include: cruciferous vegetables like broccoli and cabbage, spinach, yellow-colored fruits and vegetables, tomatoes and citrus fruits.

**Metabolic cataracts**

Diabetes poses a risk factor for the development of cataract. It is unclear what is the causative factor(s), but it does appear that strict control of blood glucose levels and excellent nutrition may help delay the onset of diabetic cataracts.

**UV Radiation**

Excessive exposure to UV rays causes a number of changes to many eye tissues, including the development of cataracts. The appears to be causal relationship between combined alcohol consumption and UV exposure and the development of cataracts. Persons involved in outdoor activities may find that good sunglass eye protection may help to mitigate the effects of sunlight on sensitive eye tissues.

**Trauma**

Blunt trauma (e.g.: a blow to the head) can cause the iris to impact the surface of the lens. This sometimes leaves iris pigment flakes on the front surface of the lens and occasionally the impact results in lens tissue degeneration. Direct physical trauma to the lens from, for example, a penetrating foreign body, can cause cataracts.

**Hereditary, congenital**

There is some evidence that genetics play a role in the development of cataracts, probably as a result of a metabolic variance. Occasionally, there is an error in the development of the lens prenatally which results in a congenital cataract---one which you are born with. Sometimes these are severely debilitating and can cause blindness if not operated upon and repaired shortly after birth. There are also examples of congenital cataracts that are quite minor and require no treatment.
Prevention and treatment of cataracts

As discussed previously, prevention requires elimination of those risk factors for which you have some control. These include:

1. Reduce exposure to UV radiation. Wear sunglasses and hats while in the sun.

2. Do not smoke cigarettes and avoid exposure to sunlight while consuming alcohol. Alcohol in more than moderate amounts may by itself be a precipitating factor.

3. Diabetics need to careful control their disease, to help mitigate cataracts and many other systemic complications.

4. Eat a diet rich in the micronutrients which may play a role in the aging of the eye.

Treatment

Surgical removal and replacement of the clouded old lens with a new plastic model is the recognized treatment. The procedure can be done as quickly as 10 minutes or less, although the patient required pre- and post-op care that might make the surgery stay as long as an hour or more. The procedure is done in the hospital and now, more commonly, in office-based “surgery centers.” As an alternative, and for historical reference, common prior to the advent of successful surgical intervention there is the removal of the old lens followed by optical correction with contact lenses or spectacles.

In earlier stages of cataracts, there are often optical prescription changes and getting a new pair of eyeglasses or contact lenses may restore vision to acceptable levels.

Management of illumination sometimes helps people with cataracts. Sometimes reducing light levels reduces light scatter inside the eye and improves vision. This can be accomplished using gray or gray-yellow tinted lenses. Lenses that selectively filter the shorter wavelengths (below 480nm) may improve contrast by reducing light scatter and crystalline lens fluorescence.

There are also times when increasing light levels allows for better image quality.

In the future

Currently, most lens implants are set for either near or distance focus and the post-surgical eye requires additional spectacle or contact lens correction for the opposite focus. Lens implants are now available with multifocus optics, possibly eliminating the needs for eyeglasses or contact lenses altogether.
And is certainly within the realm of possibility is to actually prevent cataracts through nutritional and/or drug therapy. This form of treatment may be coming very soon, or may remain a wishful theory for the future.

Meanwhile, remember that cataracts are nothing to fear. Treatment is available and, when the clouded lens is the primary cause of decreased vision, it is almost always effective in restoring good to excellent vision.