Everything Cataract

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The word cataract is derived from the Latin word cataract. While it has other meanings, in ophthalmology it refers to an opacification or clouding of the crystalline lens of the eye or capsular membrane which surrounds and protects it. There are multiple causes of cataract. For example, smoking, aging, diabetes, trauma, certain eye diseases and chronic steroid use are some of the associated causative factors related to cataract formation.

Biochemically speaking, some of these conditions can result in what scientists call protein denaturation, causing the natural lens to lose its transparent properties. Denaturation is the process whereby proteins lose their natural configuration when exposed to various oxidative stresses. An easily understood example of denaturation that which happens when one cooks transparent raw egg whites. We all know they turn white under the oxidative stress of high heat.

The natural configuration and density of lens fibers are what give the crystalline lens its clarity. Sometimes aqueous fluids can leak through the capsule into the lens and cause the lens substance to become a non-transparent emulsion. Finally, the natural growth of lens fibers that occurs with age can cause increasing lens density resulting in loss of lens clarity.

By now it is obvious that the presence of cataract can cause adverse visual symptoms. How much one is disturbed by this visual disability often depends on the visual expectations of the individual. For example, a truck driver who often is on the road during the night will most definitely be more visually symptomatic then an elderly person who does not drive at night. Descriptions of cataract's visual effects include a general blurring of sight, double vision, and starbursts or haloes around lights. Paradoxically, improvement in near vision can occur while distance vision worsens. A visit to an ophthalmologist will allow the professional to determine the nature of the visual disturbance: whether it is caused by cataract, glaucoma, macular degeneration or simply a need for new spectacles. Oftentimes the visual disability is caused by a combination of the above conditions. Examination will help determine the contributory nature of the above conditions, if present.

Once cataract has been determined to be an important cause of the visual disability a number of decisions need to be made. The first one is whether or not surgery is required to correct that portion of the disability caused by cataract. If the answer is no, then obviously no further cataract surgery decisions are necessary and either treatment for other eye conditions or only periodic rechecks and or new glasses are necessary. If the visual impairment due to cataract is significant and the functional need for better vision is necessary, then plans and decisions for cataract surgery can be made.

Before proceeding with discussions on the particulars of cataract surgery we need to pay homage to the fact that the eye does not exist in isolation from the rest of the body! When eye surgeons operate on the eye we are in fact operating on the human body. Any type of surgery is a stress on the body. Admittedly eye surgery is less invasive then operating on the chest or abdomen but the medical condition of the patient and physical stresses of surgery should be taken into account prior to surgery. Does the patient have a very precarious cardiac status? Does the patient have severe emphysema? Should the blood thinner Coumadin be continued prior to surgery, reduced in dose or stopped? Is the patient an insulin dependent diabetic? If so, should the patient have surgery in the morning or is the early afternoon ok? Should they take insulin or withhold it prior to surgery?

Clearly the medical status of the patient needs to be taken into account prior to surgery. It is important that each patient have a medical clearance by their primary care physician prior to surgery. Recommendations as to medications and related issues are best left to these professionals. Pre-operative medical testing such as blood work and electrocardiograms are often a necessary part of this medical clearance.

Once the clouded crystalline lens or cataract is surgically removed it must be replaced within the eye with an artificial lens (intraocular lens) in the same location as the natural lens during the surgical procedure. This is so because without a replacement lens images may not be cloudy, but they would certainly be out of focus. These intraocular lenses(IOLS) come in different powers or prescriptions which can be chosen to meet the needs of the individual patient. For example, a very near-sighted person who has worn glasses their whole life and who has a cataract in only one eye would require an IOL that continues to make him or her nearsighted. That is because the brain cannot adapt to a visual situation where one eye is nearsighted, and the other eye is normal sighted.

On the other hand, take that same nearsighted individual and assume he has a similar cataract in both eyes requiring surgery. It is very likely this individual would opt for IOLs that give him or her normal vision without the need for glasses. That is because both eyes would be operated upon within a short period of time. This person would in all likelihood be thrilled to be free of

glasses for the first time in their life. Clearly the possibilities and permutations as to the appropriate IOL power choice are myriad.

A lengthy discussion with the eye surgeon is key to raising all the issues and concerns about IOL power that are critical to a satisfactory result. After the decision for proceeding with cataract surgery is made, the decision regarding IOL power choices may be the next most important decision! If the IOL power chosen will enable the patient to see well for distance without spectacles, then a further IOL power discussion needs to be made and an additional lens choice made. So far in this discussion I have been referring to the distance vision IOLs afford. In the past few years IOLs which can correct for both distance and near vision have been available. These lenses are referred to as premium IOLs as compared to the traditional stand IOLs which only correct for distance vision.

Premium IOLs are available from different manufacturers and each one uses different optical technology to allow the patient experience good close as well as distance vision. These lenses fall into two categories. First is the accommodative type of IOL which mimics the eye's natural focusing power for close vision. Second are the multi-focal type IOLs which bring into focus both near and far vision simultaneously and depends on the brain to choose which distance or near object to pay attention to. All of these lenses generally work quite well. However, because each lens has its own optical characteristics, some patients with certain ocular conditions may do well with one lens but not another. For example, if a patient has had significant glaucomatous damage to the eye, he or she may have a better visual result with an accommodating IOL rather than a multi-focal lens.

Recently an additional type of premium IOL has become available. It is called a toric IOL. Toric is the ophthalmic term for astigmatism. In other words, the IOL incorporates an astigmatic correction. Cataract surgery by itself may correct some astigmatism caused by the natural shape of the patient's cornea. However, depending on surgical technique and the degree of corneal astigmatism present, the patient may or may not benefit from the implantation of an astigmatic correcting toric IOL.

Considering the above discussion, it should be obvious that an in-depth dialogue regarding IOL choices needs to take place between the patient and the eye surgeon prior to surgery. This dialogue should include the need for surgery, the visual requirements of the patient and the proper IOL choice. Finally, as regards premium IOLs it is important to know that insurance of all kinds does not cover the cost of these lenses. In other words choosing a premium IOL requires an out-of-pocket expense to the patient.

The actual surgical procedure itself typically take half hour or less. There are some circumstances, usually due to a patient's anatomy or coexisting ocular condition which make

the surgery more complex but not necessarily less successful. For example, on occasion, and individual's pupil may not dilate or enlarge sufficiently either due to weak pupillary muscles, coexisting ocular disease or as a side effect of certain medications such as Flomax. Dealing with situations of this nature can take some extra time but they are not insurmountable.

Patients are often concerned about how they can stay still for the surgery. This is of course a legitimate question. At our certified eye surgical center, a board-certified anesthesiologist administers some intravenous sedative medication. This is intended to take the edge off of the patient's anxiety. While not intended to put the patient to sleep, people often fall asleep for a short while. During this pre-operative period an injection of numbing medicine, often Novocain is injected into the tissues around the eye. It is not injected into the eye! This injection involves very little discomfort and is akin to injections used in dental procedures. The purpose of the injection is not just to eliminate surgical pain. It also temporarily immobilizes the muscles that move the eye in its various directions of gaze. In this way the eye will not just stay pain free, but will not move during the surgery.

In certain medical circumstances such injections are contraindicated. Additionally, certain individuals may prefer not to have such injections for personal reasons. In these cases, the surgery is performed using topical anesthetic eye drops in conjunction with an injection of anesthetic solution into the eye after an incision has been made. While such a technique insures the patient will feel no pain, it does not ensure the eye will not move during surgery.

Movement of the eye during surgery is a significant risk factor and the patient who elects this type an anesthesia needs to understand the level of cooperation required for surgery and be capable of this fulfilling this commitment. My own person choice is to perform surgery using anesthetic injections to immobilize the eye. My reasons are twofold. First it decreases the anxiety of the patient who is trying hard not to move their eye. Second, it is one less concern the surgeon needs to focus on.

After the patient has been made comfortable on our upholstered operating room table he or she is prepped for surgery. This involves dabbing the area around the eye with betadine antiseptic and draping the patient so that from the knees up only the area around the eye to be operated on is exposed. A lid speculum is used to keep the eyelids apart during the surgery. Once these steps are completed the actual surgery can begin. Usually two small incisions are made at the edge of the cornea. One of these is used for a fine instrument that can be used to help manipulate the lens within the eye. The other incision is used for the hand piece of the phacoemulsification machine. The tip of this hand piece is approximately only 3mm in diameter. Therefore, as you can see these incisions are very small. Phacoemulsification means that the crystalline lens is emulsified or broken into small pieces (phakos is the Greek word for lens). This achieved by ultrasonic energy. Ultrasound energy is used to cause the titanium tip of

the phaco hand piece to vibrate tens of thousands of times a second. This vibration is so quick and the distance of the movement so tiny that the tip does not appear to be vibrating at all. A buzzing sound when phacoemulsification is takin place is always present.

The phaco hand piece also includes an irrigation and suction feature. Suction is used to extract the small pieces of cataract made during phacoemulsification. Simultaneous irrigation with a balanced electrolyte solution is automatically performed throughout the procedure. In this way the eye will stay formed throughout the procedure.

In the past few years so called femto lasers have been introduced as a modality for cataract surgery. The femto laser has the advantage of creating corneal incisions through which the cataract can be removed. Similar incisions can also be used to alter the corneal curvature which can reduce astigmatism. Additionally, it fractures the cataract into tiny fragments which can then be aspirated out of the eye. Phacoemulsification is till utilized but to a far lesser degree. And of course, the use of laser does not mean that we do not have to enter the eye. After all, a lens must still be inserted.

Additionally, all insurances regard the femto laser as a premium product and therefore it is not covered. And so, if a laser is incorporated in surgery the patient must expect to pay out of pocket for its use.

Patients undergoing surgery without anesthetic injection may elect to have no shield placed over the eye immediately after the surgery and during waking hours. Use of a protective shield during sleep is however a good idea for obvious reasons. Use of a shield for the first day is also an option for those not entirely comfortable having their just operated eye totally exposed.

Non-stitch cataract surgery has become the norm over the past decade or so. This advance was made possible due to several factors. As intraocular implants have changed from rigid plastic to soft foldable materials surgeons have been able to make cataract wounds smaller. The caliber of our surgical instruments and IOL injectors has also become narrower therefore facilitating smaller wounds. Smaller wounds are less likely to leak and therefore less in need of stitches. Additionally, understanding the effect of wound construction upon wound leakage has advanced. This has also allowed eye surgeons to make wounds which are less likely to leak. Finally, pre-operative, intra-operative and post-operative use of antibiotics has greatly reduced the risk of infection.

Still, the risk of intraocular post-operative infection while very low can still occur. For this reason, most surgeons will place one or more stitches if it appears the surgical wound is not water tight. Placement of sutures in such cases reduces the risk of infection.

Most surgeons try to reduce or eliminate corneal astigmatism during surgery. In certain cases, the use of a stich can reduce astigmatism. Once the corneal incision heals sufficiently the suture can be removed. Doing so is painless and performed in the office. After placement of anesthetic drops, a very fine needle is used to cut the suture which is just under the surface at the edge of the cornea. It is removed with a very fine jeweler's forceps (tweezers). While most patients are somewhat apprehensive of this minor procedure they all are amazed how painless and quick suture removal is.

The daily use of eye drops is required for several weeks post-operatively. Antibiotic drops are required for approximately one week to prevent infection. It is also important to reduce the post-operative inflammation which occurs in all patients. Most surgeons will prescribe steroid eye drops for anywhere from one to three weeks. In recent years the use of a non-steroidal anti-inflammatory eye drop (nsaid for short) medication has become standard.

This medication not only reduces inflammation in the front part of the eye but also prevents or reduces swelling in the retina at the rear of the eye. This helps to improve the final visual result. The nsaid drop is used for anywhere from four to six weeks.

Finally, if spectacles are required for either distance or near vision they can be prescribed as needed at any time post-operatively. However, the earlier spectacles are prescribed the more likely they may have to be changed. This is so because as the surgical wound heals the corneal curvature may slightly change, thereby changing the spectacle correction. Additionally, as noted above, removal of any stiches may also alter the corneal curvature. Still, early post-operative spectacle changes may be necessary based on the visual needs of the individual patient.

In this short essay I have tried to impart enough information to allow the average individual to understand the important aspects of cataract and its management. It is in no way a comprehensive treatment of the subject. I would encourage all patients to pursue a dialogue with their eye surgeon in order to design the cataract management that best suits their individual needs.