

# CATARACT

## An Overview

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### IMPORTANT

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### Introduction

A cataract is the term given to a 'lens opacity', and it covers the smallest 'dot cataracts' to the 'hyper full-blown cataracts' which seriously impair vision.

### Age and Incidence

Cataracts become more common the older one becomes:

- 50 to 59 years - 65% of individuals will have some opacity
- 80 years and above - virtually all individuals will have some opacity

Additional causes of cataract include:

- Diabetes
- Past eye trauma
- Steroid use

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### Cataract

Cataract is a congenital or degenerative opacity of the lens that leads to a gradual loss of vision.

### Causes and Incidence

Cataracts are associated primarily with aging (senile cataracts) and chemical changes in lens proteins. Trauma, toxins, systemic disease, and intraocular inflammation are also causes. Congenital

cataracts, which are rare, are the result of inborn errors of metabolism, exposure of a first-trimester fetus to rubella or toxins, and congenital anomalies. Cataracts are the third leading cause of blindness, and virtually everyone would develop cataracts if they lived long enough. More than 60% of those over 65 years of age and 90% of those over age 85 demonstrate lens opacities.



A cataract is an opacity of the normally clear lens which may develop as a result of aging, metabolic disorders, trauma or heredity

### Disease Process

Senile cataracts form as a result of a chemical change in the gelatinous lens protein encapsulated behind the iris. As a result, the protein coagulates, the lens gradually clouds, and normal lens fibers swell and migrate within the lens. Because of these changes, a blurred image is cast on the retina.

(Picture right - Senile Cataract)

If the condition goes untreated, the opacity eventually becomes complete and blindness results.

### Symptoms

Symptoms include progressive, painless blurring and distortion of objects, glare from bright lights, and gradual loss of vision. Signs include a gray or white coloring on the pupil (Picture below), and myopia.



## Potential Complications

The primary complication is blindness.

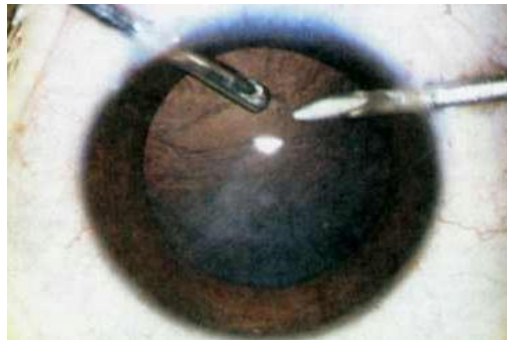
## Diagnostic Tests

Cataracts are identified by ophthalmoscopic or slitlamp examination.

## Treatments

**Surgery** - Intracapsular or extracapsular removal of the lens; follow-up laser surgery to remove secondary membrane that often forms

(Picture below - Cataract by Aspiration)



(Picture below - Cataract by Excision)



**Drugs** - Topical anti-infective drugs, mydriaticcycloplegics, and hyperosmotic agents are used preoperatively; corticosteroids and mydriatics are used postoperatively

**General** - Corrective lenses, lens implants, and eyeglasses to correct hyperopia (farsightedness)

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## Cataract Surgery

When visual acuity reaches a level of less than 6/18, it is generally considered to be low enough to recommend the removal of the cataract to improve the individual's quality of vision. There are several different cataract operations available today:

- 1) Extra-capsular method
- 2) Intra-capsular method
- 3) Intra-ocular method

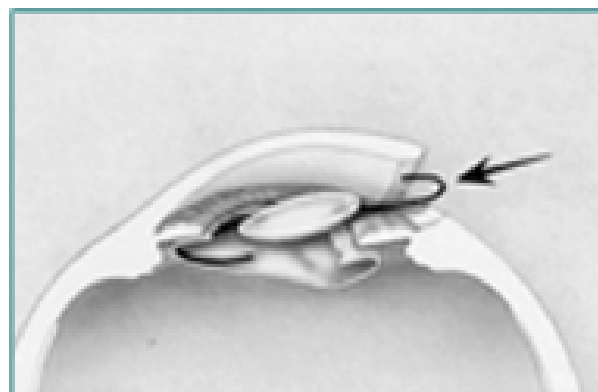
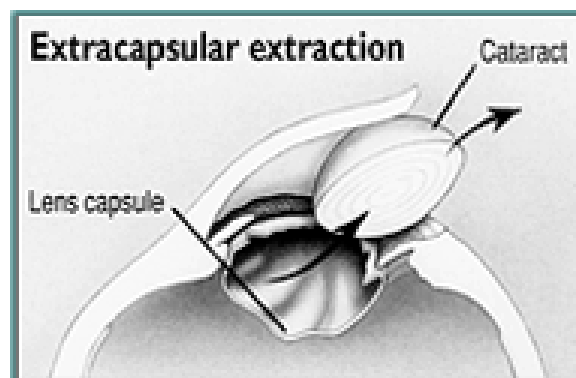
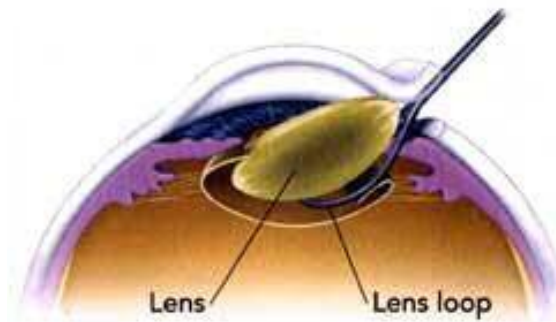
## 1) Extra-Capsular Method

With the extra-capsular method, the cataract is removed from the lens itself, and then an artificial lens is placed within the lens capsule

- Typically requires an incision of 10-12mm
- The clouded lens is extracted in one piece
- A non-foldable lens is implanted
- Typically, multiple stitches are required
- Chances are high of post operative cylindrical number astigmatism

Thus, in this procedure, a small incision (about 11mm) is made in the sclera. Then, a special needle is used to create an opening in the front surface of the lens bag (capsular bag). The central lens nucleus is then removed through the opening, and the softer cortex is then aspirated through a small vacuum instrument. The capsular bag is left in place and intact (except for the opening in the front through which the cataract was removed). This allows for safer placement of an artificial lens implant into the capsular bag.

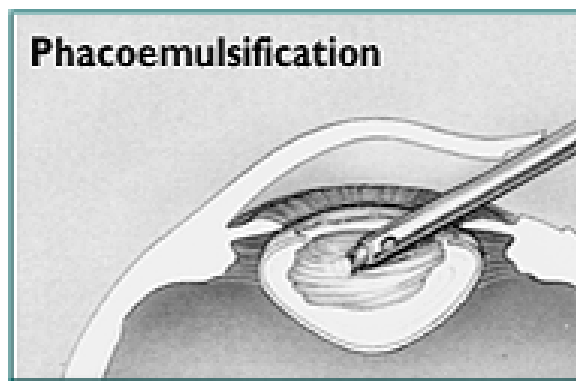
(Pictures below - Extra-capsular Method)



### Phacoemulsification Method Note

More recently, a method known as 'Phacoemulsification' (Phaco, for short) allows for much smaller incisions. The incision is only 3-4mm in length. Again, the front surface of the lens bag is opened to gain access to the lens. Then an instrument using ultrasound energy is inserted through the small incision, and the ultrasound is used to break the central lens nucleus into smaller pieces - which are then aspirated through the small incision. The softer cortex is also aspirated the same way. This technique, in addition to the advent of foldable ocular implants (implants which can be folded to fit through the small incision, and then open up once inside the lens bag) allows for small incisions to be made. This small incision augments faster healing, and sometimes, does not require any stitches. This is by far the most widely used technique today.

(Picture below - Phacoemulsification)



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### 2) Intra-capsular Method

With the intra-capsular method, the complete lens is removed and an iridectomy made to take the lens out. This is often done at the top of the eye, so that a black triangular hole is left in the iris. Thus, in this procedure, a large incision (about half the circumference of the cornea) is made in the sclera. The cataract is then removed as a whole (capsular bag included), and the incision is then sutured. This method is rarely used today - the extra-capsular method being preferred.

(Picture below - Intra-capsular Method)

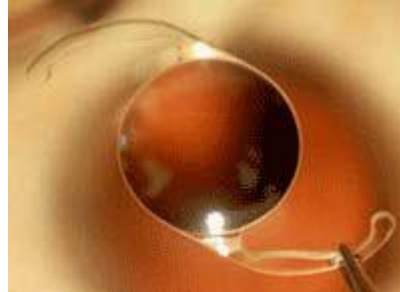


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### 3) Intra-ocular Method

With the intra-ocular method, the lens is removed, and an intra-ocular lens is positioned within the eye itself.

(Picture below - Intra-ocular Lens Implant)



#### Lens implants

With the old intra-capsular method, since the lens bag is removed, the eye is left empty. Consequently, after surgery, patients would require thick "bottom-of-bottle" glasses or contact lenses. However, the newer methods allow for the lens bag to be left in place, and thus allow surgeons to be able to insert lens implants into the bag. This then alleviates the need for thick post-operative glasses or contact lenses. Moreover, the implants allow for patients to be able to wear regular glasses, or in some cases, none at all. However, most individuals will still require reading glasses.

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### Modern Cataract Surgery - The Phacoemulsification Method In More Detail

#### Introduction

Of all the fields of medicine, cataract surgery has been one of the greatest beneficiaries from advances in techniques and technology. Not so long ago, cataract surgery involved lengthy delays marked by deteriorating vision while the cataract 'ripened,' an extended and confining recovery period, plus the need for unsightly 'cataract' glasses or contact lenses to achieve functional vision after surgery.



A cataract is an opacity of the normally clear lens which may develop as a result of aging, metabolic disorders, trauma or heredity

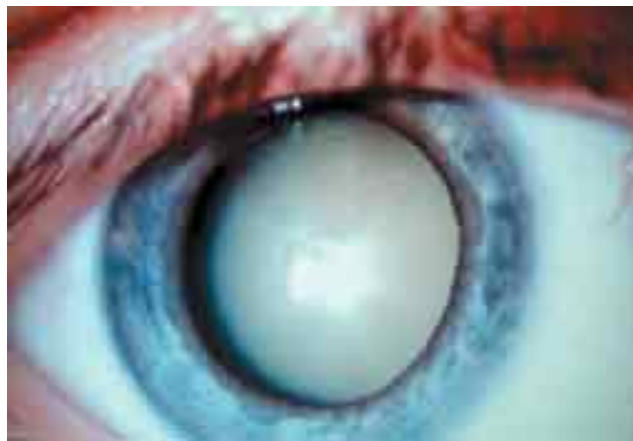
Today, cataract surgery is a simple, and typically, an out-patient procedure. The stay at a surgery centre is just a few hours, and the recovery time after surgery is dramatically reduced. Many individuals enjoy improved vision with minimal dependence upon corrective eyewear as a result of modern cataract surgery.

### **Evolution of Cataract Surgery**

A few short years ago, the accepted method of cataract surgery was to open the front portion of the eye, and pluck out the cataract like a grape. This meant that the cataract had to 'mature' or 'ripen' to the point that it was firm, thus making it easier for it to be grasped. For the cataract to reach this stage, vision in the eye became dramatically impaired, often to the point of near blindness.

At first, there were no suitable materials to use as sutures in the eye, so the eye had to be bandaged and to heal on its own. This meant the individual was confined to bed with their head literally sandbagged to prevent movement that might compromise the healing process. 'Cataract' glasses with thick lenses or contact lenses were also required to assume the focusing power of the natural lens, which was also removed during surgery. Unfortunately, memories of this type of procedure have caused many people to wait needlessly before having cataract surgery.

(Picture below - Mature Cataract)



### **'No-Stitch' Cataract Surgery - Using a Self-Sealing Wound**

Although sutures were a major advance in eye surgery, they have been supplanted in most cases by the use of a 'self-sealing incision'. The shape of the incision creates a flap that takes advantage of the natural fluid pressure inside the eye to seal it shut without the need for sutures. However, not every cataract surgery can be performed as a 'No-Stitch' procedure. The decision to place a suture is made by the surgeon, and always has the individual's situation, condition, and best interests in mind.

The advantages of 'No-Stitch' cataract surgery using a self-sealing wound include:

- Shorter surgery time
- The ability to stop surgery at any point in the procedure
- Dramatically reduced recovery time
- Less surgically-induced astigmatism
- Less discomfort after surgery

To perform 'no-stitch' cataract surgery, two other advances were necessary: 1) the development of microsurgical techniques, and 2) the creation of foldable artificial lens implants.

### **Microsurgical Techniques**

Cataract surgery is a delicate operation that involves manipulation of the tiny structures of the eye. Consequently, modern high-powered microscopes allow the surgeon to view the parts of the eye clearly.

A large incision is no longer required to allow the cataract to be 'plucked' from the eye like a grape. Now, just a tiny incision is necessary so that a probe, approximately the width of a match stick, can be used to remove the cataract. By the use of ultrasound, the probe dissolves the cataract, allowing it to be gently vacuumed from the eye.

### **Foldable Artificial Lens Implants**

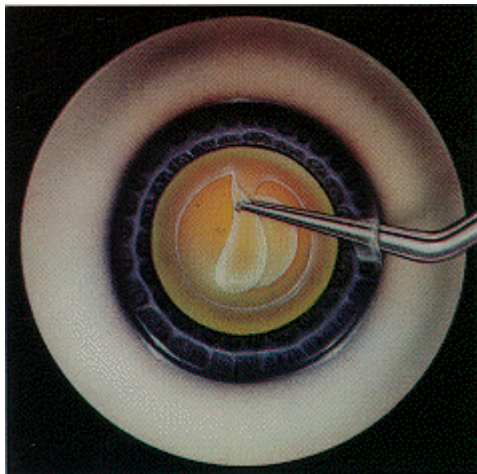
Cataract surgery removes the cloudy, natural lens of the eye. Once the natural lens of the eye is gone, another means is needed to bring light rays into proper focus upon the retina. In the past, thick cataract glasses, and then contact lenses, were used after cataract surgery to perform this function - unfortunately, both offered a less than satisfactory solution.

### **Intraocular Lenses**

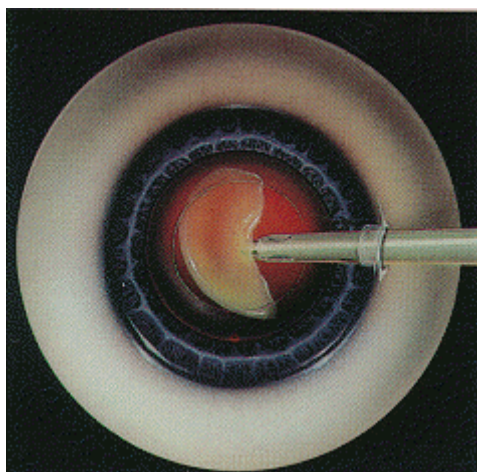
Tiny artificial lenses, called intraocular lenses, that could be placed inside the eye proved to be a dramatic solution to clear vision following cataract surgery. They are made of inert materials that do not trigger any rejection responses by the body. Through the use of careful measurements of the eye taken before surgery, it is possible to select a lens power to correct for nearsightedness or farsightedness, this helping to reduce dependence upon corrective eye wear after surgery.

### **Procedure**

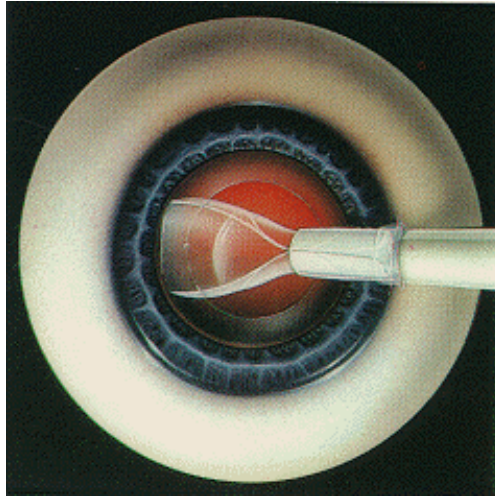
A small opening is made in the front of the capsule that holds the natural lens (Picture below).



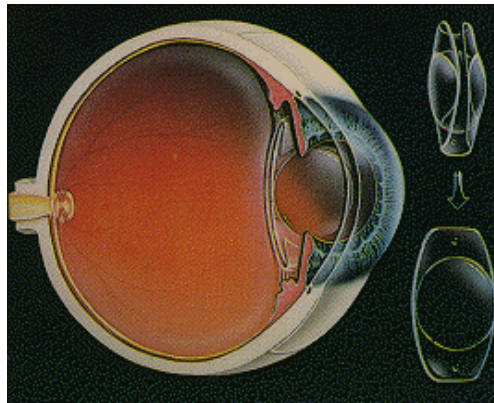
A tiny incision is made to allow for the insertion of a phacoemulsification tip which is used to remove the cataract. By use of ultrasound, the probe dissolves the cataract, allowing it to be gently vacuumed from the eye (Picture below).



By using soft material that can be folded, the artificial lens can be inserted inside the eye through the original surgical incision (Picture below).



The lens unfolds to fill the capsule much as the natural lens of the eye had done prior to the excision (Picture below).



### **Pain-free Cataract Surgery**

Cataract surgery is a pain-free experience thanks to advances in anaesthesia. The individual is awake during the procedure and are able to resume normal activities shortly thereafter. Two types of anaesthesia are used to keep the individual comfortable and pain-free during surgery: 1) topical, and 2) regional anaesthesia.

**Topical, or 'Eye Drop' Anaesthesia** - Eye drops are used to anaesthetize the eye allowing the individual to have a painless cataract procedure.

**Regional Anaesthesia** - Through the use of an injection gently given near the eye, an anaesthetic blocks all feeling in the region of the eye. To eliminate any discomfort during the injection, it is usually given while the patient is momentarily under the effect of a general anaesthetic. Regional anaesthesia gradually wears off over the course of a day. As it does, the function of the eye is restored.

Each form of anaesthetic has its disadvantages, consequently, the individual's situation, condition, and best interests are born in mind. The ultimate goal is to make cataract surgery a pleasant and a pain-free experience for the individual.

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