



Gaza Ophthalmic Centre

4.0 The Lens

Ophthalmology

FOR GP's & MEDICAL STUDENTS

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Gaza Ophthalmic Centre

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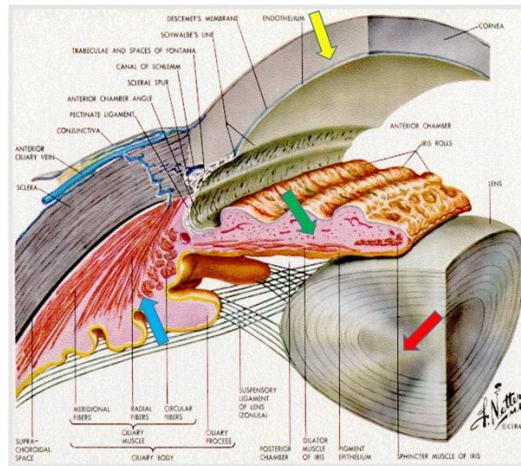
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.Good morning. This lecture is about the lens and its cataract

Lens Anatomy, AC & PC

- Lens
- Cornea
- Iris
- Ciliary Body & Muscle
- Zonules



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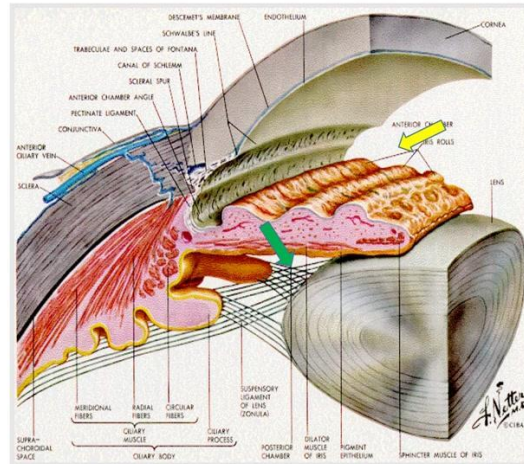
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The lens is present almost in the middle of the globe with the anterior segment in front and the posterior segment behind it

the lens in the middle is surrounded by the cornea in the anterior part with the iris. Next to the cornea between the cornea and the lens the ciliary body is present, posterior and lateral to the lens. The Zonules are ligaments that connect the periphery of the lens with the ciliary body.

Lens Anatomy, AC & PC

- Anterior segment
 - Cornea
 - Anterior chamber
 - Iris & CB
 - Posterior chamber
 - Lens
- Posterior segment
 - Vitreous cavity
 - Retina
 - Choroid



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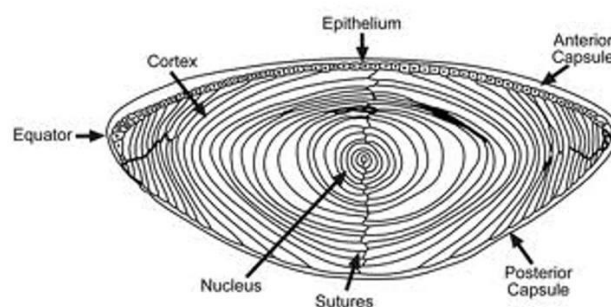
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the eye roughly can be divided into two segments anterior segment and posterior segment the anterior segment from front to back had the cornea the anterior chamber which is the space in between the cornea and the iris, and then we have the posterior chamber which is the space in between the iris the back of the iris and the front of the lens capsule. behind the lens we have the posterior segment which is full of the vitreous cavity and then the retina .and choroid in the back

The Lens Anatomy

- Lens capsule
- Epithelium
- Cortex
- Nucleus
- Equator



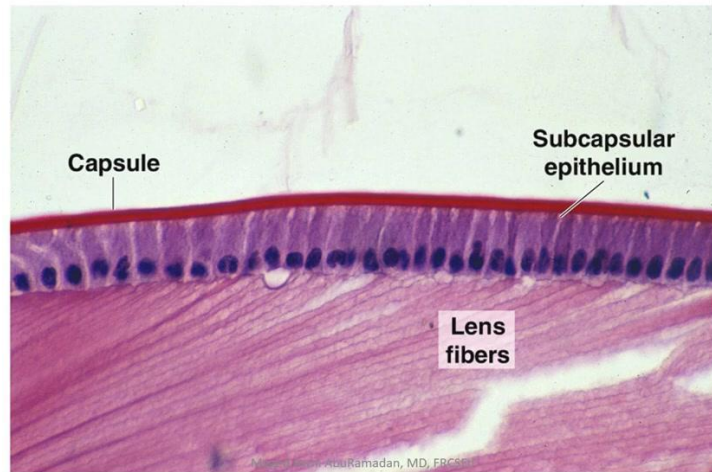
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the lens of course, is the lenticular structure it has a lens capsule all around it which is thicker on the anterior part. This part is also lined by one single layer of epithelium which is very active and producing lens fibers. The new lens fibers are present in the periphery or the cortex while the older lens fibers are pushed into the nucleus. The equator is the line passing .by the largest diameter of the lens

Lens Capsule & Epithelium



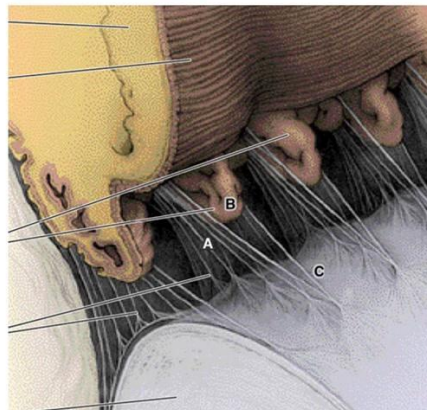
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And this micrograph we can see that the lens capsule is ... positive and stained intensely. And then there is one cell layer of sub capsular epithelium, which produces the lens fibers. Notice that the lens fibers are very long devoid of nuclei in contrast to the epithelium, and .these fibers are tightly packed together with no spaces in between

The Lens Zonules

- CB
- Ciliary processes
- Lens
- Zonules
- (Suspensory ligaments)



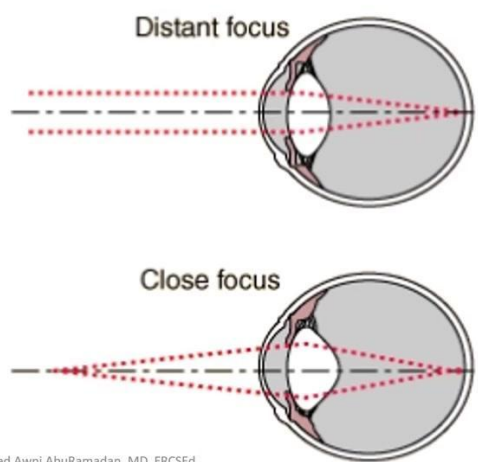
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And this diagram we can see the ciliary body which hosts the ciliary muscle inside and the ciliary processes covering and then the lens with the suspensory ligaments also Zonules .attaching the lens into the ciliary body

The Lens Accommodation

- Lens flat in far vision
- Lens more convex in near vision



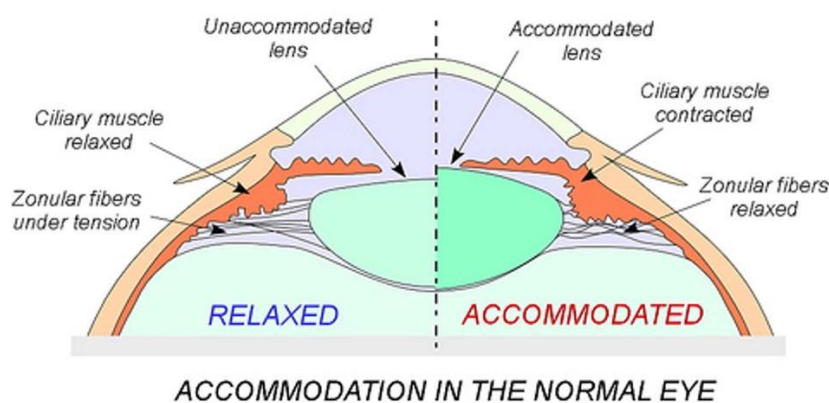
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ni the upper diagram we can see the lens during focusing on distance is a flat and the ciliary muscle is relaxed. However, when the patient attempts to focus on a near object, the ciliary muscle contracts and that leads to flatten or relaxation of the ciliary ligaments which leaves the lens to get much globular part increasing its anteroposterior diameter and sequentially .increasing its power. That's called accommodation to near vision

The Lens Accommodation



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He here we can see a diagram of the relaxed lens on the left side while in the accommodated lens on the right starts by contraction of the ciliary muscle which relaxes the zonular fiber which allows the lens to get more globular, it's pushed forward, and it also pushed the iris a little bit forward as well. That leads to shallowing of the anterior chamber in front of the .lens

The Lens Cataract



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The cataract in Latin and Greek means the frothy, white water which you can see and the) waterfall. So that's why we call the cataract

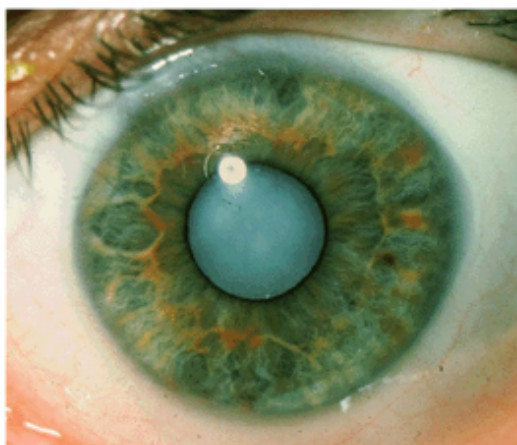
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in Arabic which means cataract or Shalla in Latin

The Lens Cataract

Cataract is

- Any lens opacity
- Any shape
- Any degree
- Any cause
- The only lens pathology is
- Cataract



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any lense opacity of any shape any degree due to any cause is a cataract. Note that the only .lens pathology possible is cataract formation

The Lens Cataract



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

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Here compare on the left normal clear lens with its black pupil and then in contrast with the .whitish gray cloud the lens Changing the color of the pupil

Types of Cataract

1. Acquired cataract
 1. Senile
 2. Presenile
 3. Traumatic
 4. Secondary
2. Congenital cataract
 1. Systemic association
 2. Non-systemic association

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Cataract can be either acquired or congenital. The acquired ones are mainly the senile the most common, the presenile, traumatic or secondary cases. congenital cataracts may or may .not be associated with systemic disease

Etiology of Acquired Cataract

- | Late onset | Early onset |
|------------------------------|-----------------------|
| 1. Old age | 1. Developmental |
| 2. Ocular / systemic disease | 1. Syndromes |
| 1. DM | 2. Galactosemia |
| 2. Uveitis | 3. Hypoglycemia |
| 3. Ocular surgery | 2. Inherited |
| 3. Drugs | 1. Myotonic dystrophy |
| 1. Steroids | 2. Marfan's |
| 4. Trauma | 3. Rubella |
| 5. Ionizing radiation | |
| 1. X ray | |
| 2. UV | |

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Acquired cataract usually of late onset due to old age or senility, as also can happen a little bit earlier due to ocular or systemic disease like diabetes uveitis, or ocular surgery. Ingestion of drugs like steroids or tranquilizer can also cause cataract. trauma, whether physical or chemical, or ionizing radiation can also cause secondary cataracts. Early onset cataracts is usually either developmental or inherited, developmental is a part of a syndromes, and especially with galactosemia and hypoglycemia. Inherited forms may present a little bit later, and that is seen in myotonic dystrophy and Marfan syndrome and in rubella

Etiology of Congenital Cataract

- | Bilateral Cataract | | Unilateral Cataract | |
|----------------------------|-----|----------------------------|-----|
| 1. Idiopathic | 60% | 1. Idiopathic | 80% |
| 2. Hereditary | 30% | 2. Ocular abnormality | 10% |
| 3. Intra uterine infection | | 3. Trauma | 9% |
| 4. Ocular disorder | | 4. Intra uterine infection | |
| 5. Tumors | | | |
| 6. Metabolic | | | |
| 7. Maternal causes | | | |
| 8. Trauma | | | |

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It's important when talking about congenital cataract to differentiate between bilateral and . unilateral cases because it has a different sort of etiology. in bilateral cataracts we found that 60% is idiopathic 30% is hereditary. The remaining 10% is due to several causes in front of them is intra uterine infection, ocular disorders, tumors, metabolic disorders, maternal

causes or trauma. However, in unilateral cataract we find that 80% is idiopathic 10% is ocular .abnormality 9% to Chroma and only very minority is due to intra uterine infection

Congenital cataracts: Bilateral

Maternal Factors

- Malnutrition
- Infection
 - TORCHS (50% cases with rubella has cataract at birth)
 - Measles
 - Varicella Zoster
 - Influenza
- Drugs
 - Corticosteroids, Thalidomide
- Radiation

Fetal / Infantile Factors

- Fetal malnutrition
- Deficient oxygenation
- Metabolic disorder
 - Galactosemia
 - Neonatal hypoglycemia
- Associated with other congenital anomalies
 - Lowe's syndrome
 - Myotonic dystrophy
- Birth trauma

Hereditary / Genetic: ~1/3rd of cases

Idiopathic: ~50% of cases

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Bilateral congenital cataracts can be due either to maternal or fetal factors, maternal malnutrition, infection with Torch, rubella, measles, varicella, influenza, drugs, corticosteroids or thalidomide and radiation Is important causes. On the fetal side we found malnutrition deficient oxygen galactosemia, hyperglycemia, or other associated congenital anomaly and their trauma is present. The hereditary or genetic form constitutes about 1/3 of .the cases the idiopathic is about 50% and the later remainder covers all the other causes

Congenital Cataract

1. Lens opacity @ birth
2. ? Squint later on
3. ? Other manifestation



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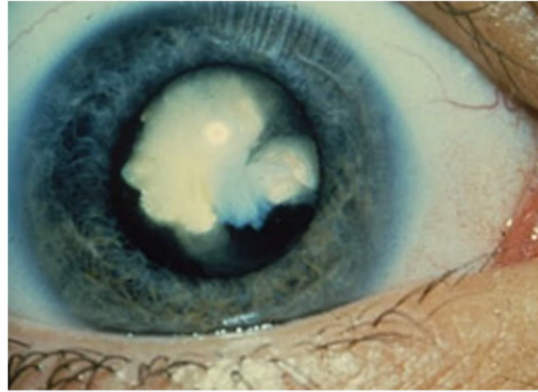
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Congenital cataract you have to find lens opacity at birth or shortly after, squint might be present or represent itself later on. And we need to look for other manifestation of systemic .or local association

Congenital Cataract

1. Floccular form



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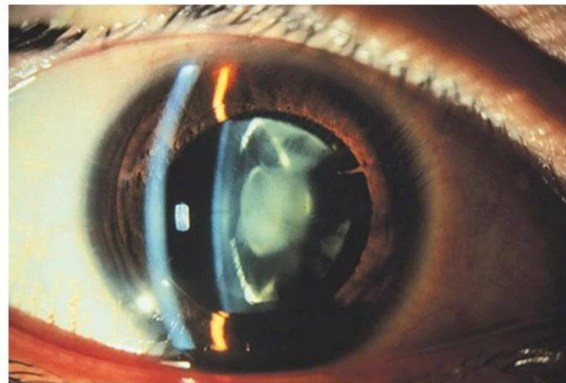
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.It can have several forms like this floccular form

Congenital Cataract

1. Lamellar form



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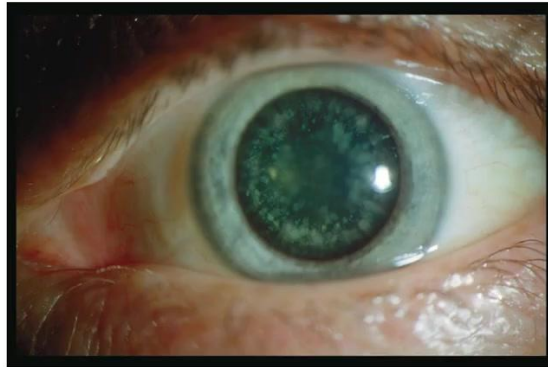
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lamellar form which means that the layers of the lens alternate between opaque layer and then followed by clear one and then opaque and clear and here we can see that there is a .nuclear opacity in the center surrounded by bore like structure in the periphery

Congenital Cataract

1. Blue Dot form



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It also can have what we call blue dot phone

Senile Cataract

1. Cortical cataract



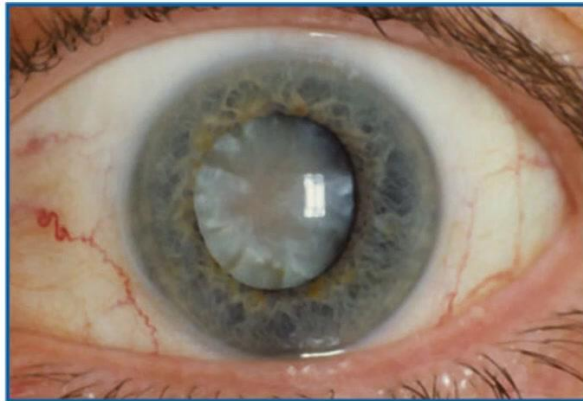
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senile cataracts, either cortical or nuclear here this is a cortical cataract with its ,
.distinguished white coloration of all lens

Senile Cataract

1. Cortical cataract



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This is a close up that shows that it's not uniformly white it is some areas are more .cataractous than others

Senile Cataract

1. Nuclear Sclerosis



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While here and nuclear sclerosis you can see that the middle of the lens or its nucleus is .taking a browne color and it is more dense than the cortex surrounding it

Senile Hypermature Cataract



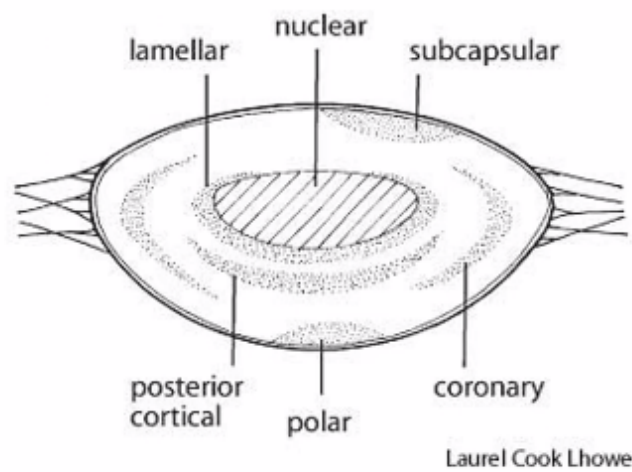
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If cataract is neglected and not treated, there might be some degeneration inside and the capsule gets weaker and it leaks and that invites an immune response which causes the capsule to get thicker, wrinkling and leaking. This type of cataract is associated with severe reduction of vision and can invite immune reaction like phacolytic glaucoma or other ocular disease.

Types of Cataract



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So in summary, the cataractous are either nuclear in the middle or in the cortex, the cortex have several subdivisions with a sub capsular or coronary shape or polar or cortical proper.

Glare due to Early Cataract



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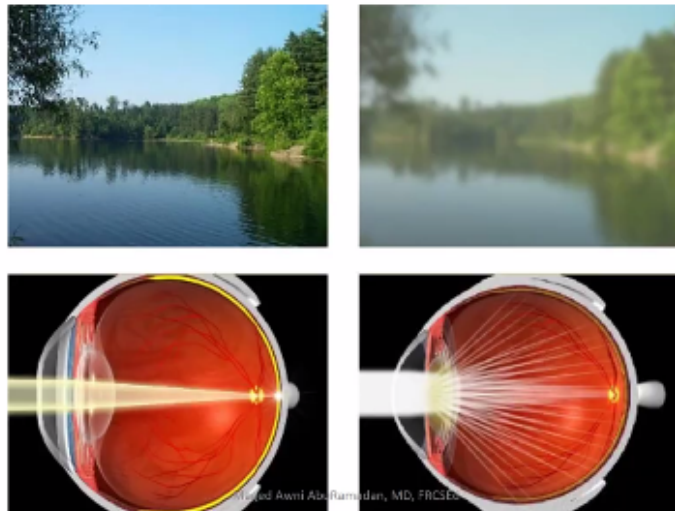
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Early cataracts usually present as glare in the sunlight or in the bright light. This glare is due to diffraction of the light over the little cataractous fibers and it caused this whitish shadow .which blurring the central vision

Blurred Vision due to Early Cataract



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Here on the left side we can see that the clear lens permits the accurate focus of the light rays on the macular and on the fovea and division is clear at maximal however, on the right side the cataractous lens diffracts and diffuses and scatters the light rays, leading to glare blurring vision and foggiess

Management of Cataract

Congenital cataract

1. Early recognition
2. Prevent Amblyopia
3. Prompt treatment
4. Team effort
5. Counseling parents

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Managing of cataract of congenital type differs greatly from adult type, in congenital cataract you have to operate as early as possible, especially if it is unilateral. early recognition is very important in order to preserve vision to prevent amblyopia from treatment is mandatory, and it needs team effort combining the ophthalmologist the pediatrician and geneticist if necessary. Counseling parents about the next offspring is very important. In such cases, especially the bilateral ones

Cataract Surgery

Old open surgery



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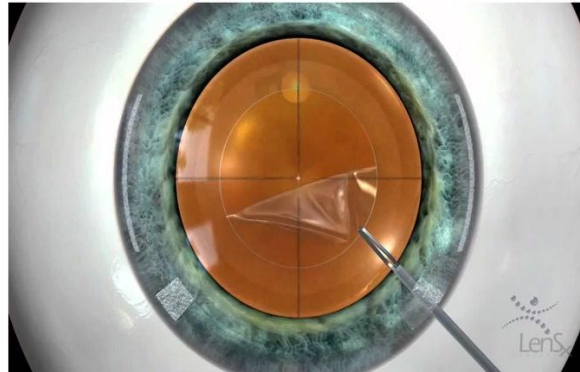
in adults, the cataract can be removed surgically and the timing is dependent on the severity on the age of the patient on his visual needs and whether it can be corrected with glasses or not. There are two ways the old open surgery when we have very large incision near the limbus and then we remove the nucleus is either as a whole in intra capsular cataract extraction or we open the capsule and remove the cataractous lens in the extract cap. That's

the old way of doing it. And usually it needs about five stitches to close the eye and it needs treatment and follow up for at least three months with medication and other measures

Cataract Surgery

New closed surgery

Capsulorrhexis



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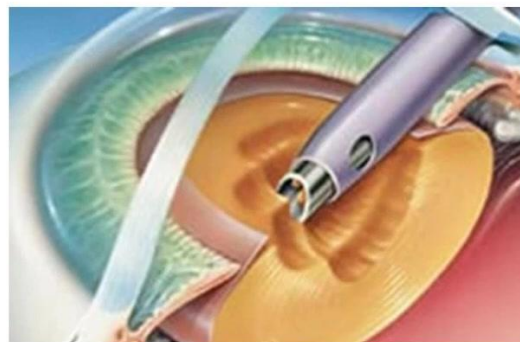


the new close surgery we used a couple of very tiny incision as small as 2.8 millimeters and we use a special instruments first to make like a circular hole in the anterior capsule called capsulorrhexis

Cataract Surgery

New closed surgery

Phacoemulsification



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We introduce a special machine or probe called phaco and phaco emulsification is the use . of ultrasonic high ultrasonic waves in order to emulsify the lens and then aspirated through the tube. Usually, this can be performed under topical anesthesia, and then a posterior chamber. Intra ocular lens implant is implanted in the empty capsular bag. It doesn't need stitches and usually the patient can go home the same day can resume work in a very short time after. Thank you very much