

INTRA-OCULAR LENS IMPLANTATION

Terms you will become familiar with in this module

cornea	sensory neurons
lens	optic nerve
conjunctiva	diathermy
aqueous humour	PHACO probe
vitreous humour	aspiration
retina	irrigation
rods & cones	optical density
limbus	ciliary muscle

ANATOMY & PHYSIOLOGY

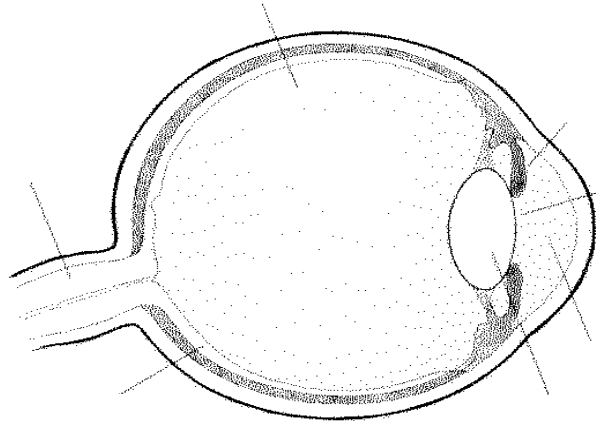
The eye is a complex optical system which can be thought of as a fluid filled camera. The front of the lens system is protected with a layer of cells [**the conjunctiva**] continuing from the inside of the eyelid. The front of the eye is a tough transparent layer [the **cornea**] which begins the focusing of light as it enters the eye. From the cornea, light is further bent as it passes through a fluid sac filled with a jelly-like mixture of carbohydrates and proteins [**aqueous humour**]. Entering the lens, light is further focused before it enters a second jelly-like liquid [the **vitreous humour**] in the main chamber of the eye. Final focusing of light occurs in the vitreous humour before the light reaches the **retina**. The retina is made up of specialised light-sensitive cells [called **rods**] and colour-sensitive cells [called **cones**]. The effect of light on the rods and cones stimulates **sensory neurons** which transit signals to the **optic nerve**. Signals caused by light meeting the retina are transmitted through the optic nerve to the brain where they are decoded to create the sensation of sight.

Because each part of the eye has a different **optical density**, the amount of bending [focusing] of light varies in each area. The only area which is consciously variable is the lens – which can be stretched by the **ciliary muscle** to make the very small change needed to shift from focus on near objects to focus on far objects.

Changes of pressure in the eye [**glaucoma**] can affect ability to focus as structures such as the lens are moved from their normal position and optical density changes. Changes in the flexibility of the lens and the ciliary muscle with age may change focus between short, long and normal sight. Commonly, loss of flexibility of the lens produces a loss of near sight with aging.

ACTIVITY

Use a reference book to label the diagram below with: conjunctiva, cornea, lens, lens capsule, pupil, aqueous humour, vitreous humour, limbus, retina, blind spot, optic nerve.



CASE STUDY

Equipment which is ***emphasised***, referred to or used in this case study includes:

- Microscope
- Camera
- Video recorder
- TV monitor
- *Diathermy*
- *Diathermy lead*
- *PHACO*
- Aspiration system
- Irrigation system

Mrs Apple is a 65 year old woman with **non insulin dependant diabetes** [a disease where the level of sugar in the blood is above normal]. This was diagnosed when she was 50. For the past 5 years she has been experiencing a deterioration in her vision and has been diagnosed as having **cataracts**. Her right eye is worse than the left. She is finding that the activities of daily living are becoming increasingly difficult and she is losing her confidence to travel away from familiar environments. She has stopped driving after several minor accidents so she no longer visits some of her long-time friends.

QUESTION

What is a cataract?

Are cataracts more common among particular cultural groups?

Are there particular environmental features such as climate or diet which influence cataract incidence rates?

What is an intra-ocular lens?

Mrs Apple is admitted to day surgery for a **cataract extraction** and insertion of an **intraocular lens** to the right eye.

Mrs Apple changes into a hospital gown and has some drops instilled into her eye which dilate the pupil. She is asked to lie on a trolley for transfer to the operating room. Mrs Apple will have the procedure under **local anaesthetic** so that she can recover more quickly and return home sooner. This also avoids the risks of general anaesthetic [see section on anaesthesia]. Before being moved into the operating room the anaesthetist injects some local anaesthetic **behind her eye** and it is **not long** before her eye does not register pain.

She is wheeled to the operating room and transferred to the operating table where she is encouraged to make herself comfortable because she will have to lie very still for up to an hour. The area around her eye is cleaned, a **sterile field** is created and the operation begins.

The surgeon operates through a **microscope** to magnify the structures of the eye. A video-camera connected to a monitor gives the other staff in the room a view of the procedure and a videotaped recording is made.

The surgeon makes an incision into the eye at the **limbus** and uses **diathermy** to control bleeding. The diathermy does not work well so the staff open a new **diathermy lead** which works effectively.

QUESTIONS

What could have caused the diathermy machine to malfunction? What complications would have been introduced if a second diathermy lead had not been available?

Identify the parts of the diathermy apparatus which can be serviced routinely.

Establish a pre-operation checklist for reducing the chance of malfunction.

The surgeon makes a hole in the lens capsule and introduces the **PHACO probe** into the lens. The lens is broken up by the phaco and sucked away [aspirated]. Irrigation is provided to the area via the phaco probe to assist the aspiration as this delicate work is being done.

In the past, surgeons used to remove the lens as one whole piece. This required a larger incision in the eye which was then sutured at the end of the operation.

QUESTION

What is the advantage of breaking the lens into small pieces with the PHACO machine?
How does irrigation assist the aspiration process?

Midway through the operation, the PHACO machine seems a little inconsistent in its action and the surgery is slowed down but is still completed effectively.

QUESTIONS

Where does the word **phaco** come from?
How does the phaco probe work?

When all the lens has been removed, the intraocular lens is inserted. Antibiotics are injected into the conjunctiva and an eye pad is applied to protect the eye.

Mrs Apple goes home the same afternoon wearing the eye pad and comes back to the surgeon's clinic to have the pad removed the next day.

QUESTION

You receive a call from the operating room staff requesting you to check the PHACO machine before the next patient is operated on. They decide to do an operation in the mean time that does not require the PHACO machine while you do your checks; but if the machine is not working properly the next 4 patients for the day will have to be cancelled.

What are the likely causes of inconsistent output?
Are any of these repairable within the time frame suggested?
How would you explain the possible problems to the surgeon if you were asked?
How would you explain the problems to a patient who has to come back again for their surgery?
Read about the effect of diabetes on fluid pressures within the body [and particularly within the eyes]. How might Mrs Apple's diabetic condition threaten the success of her operation if the procedure had to be extended because of faulty equipment?

ACTIVITY

Consult with nursing and/or medical staff to find out what options would have been available if the phaco had ceased to function midway through the removal of the lens.

REFERENCES

Alcon International (1991) **So your doctor said, "You have a cataract"**
Texas: Alcon International