

Primary Angle Closure Glaucoma

What is Glaucoma?

Glaucoma is a condition in which there is damage to the optic nerve. This nerve carries visual signals from the eye to the brain. Damage is usually caused by a build-up of fluid (aqueous humour) within the eye, causing the pressure inside the eye to rise. In early stages of glaucoma the patient may experience no symptoms but if left untreated, glaucoma can lead to severe loss of vision or even blindness.

Broadly, glaucoma can be divided into two categories: open angle glaucoma and angle-closure glaucoma, depending on whether the iridocorneal angle (through which the aqueous drains out of the eye) is obstructed by the iris (coloured part of the eye) or not. The treatment of angle closure and open angle glaucoma is different therefore it is important to make this distinction.

Iridocorneal angle of the eye

Iridocorneal angle (or just “the angle”) is the area between the iris, and the cornea, the clear window over the front of the eye, in the area where the cornea meets the sclera (the white of the eye). In the angle there is a ring of spongy tissue (or drainage channels), the trabecular meshwork of the eye are situated here from which the fluid drains out of the eye. (Figure 1)

Medical examination of the iridocorneal angle is typically carried out in a technique called gonioscopy. This is performed on the slit lamp (the microscope used in the eye clinic) with a special lens (called a gonioscope). This lens is placed on the surface of the eye after putting in a local anaesthetic eye drop to numb the eye and minimize any discomfort.

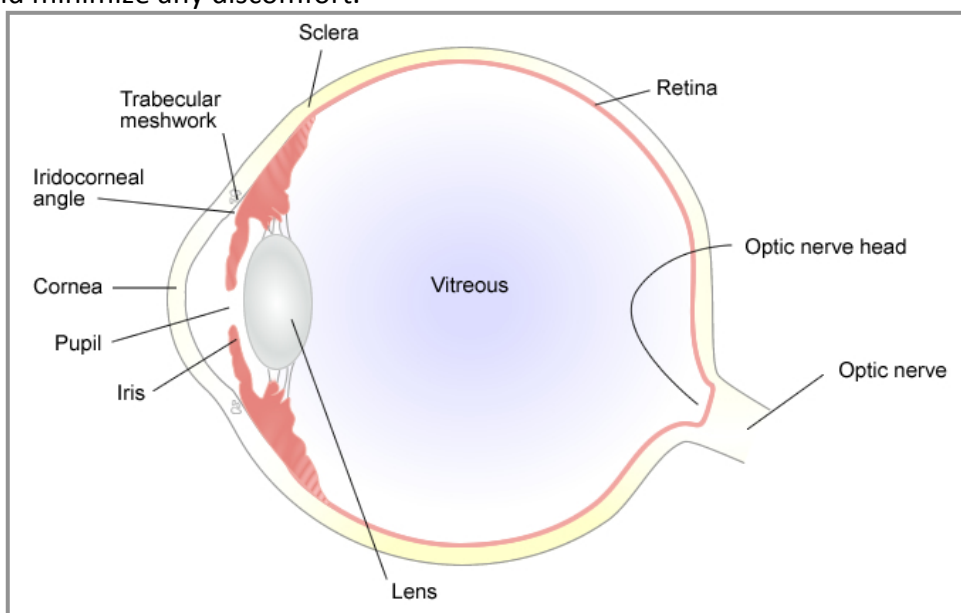


Figure 1. Anatomy of the eye.

Aqueous fluid production and drainage

The aqueous is a clear fluid that fills the eye; it supplies oxygen and nutrients to the inner tissues of the eye. It is produced constantly by the ciliary body located behind the coloured part of the eye, the iris. This fluid circulates to the front chamber of the eye via the pupil (central black hole in the iris) to drain out of the eye through the irido-corneal angle. This fluid then exits through the trabecular meshwork into blood vessels. (Figure 2)

Normally, production and drainage of aqueous is balanced and results in just enough pressure for the eye to maintain its shape without any damage. If the angle is closed or the trabecular meshwork is blocked (or both), then the pressure may rise and cause glaucoma.

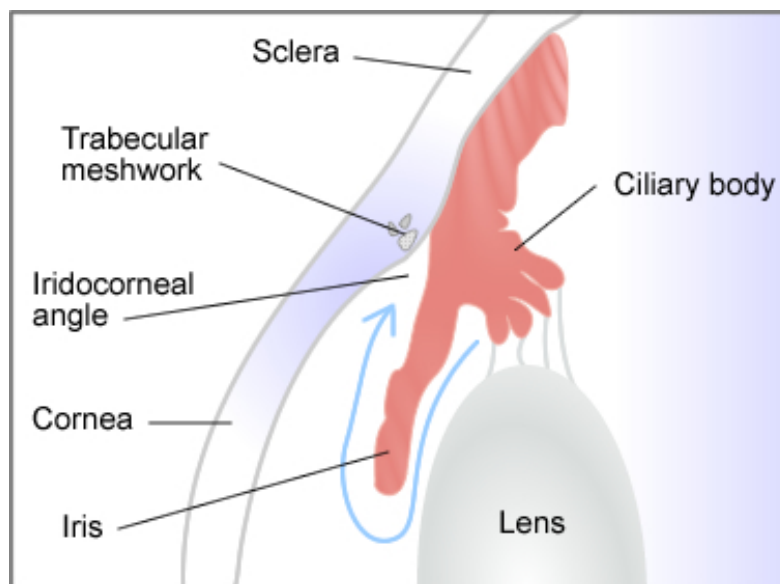


Figure 2. The normal flow of aqueous, from the ciliary body to the trabecular meshwork through the pupil and iridocorneal angle.

What is Angle Closure?

Angle closure develops when the iris touches the majority of trabecular meshwork. If this contact is associated with high eye pressure or areas of permanent closure (scarring) of the angle then there is established angle closure. In time, this may lead to damage to the optic nerve- called angle closure glaucoma.

It is important that eye specialists look specifically for signs of angle closure during routine examinations, as most patients with this condition experience no symptoms. Some people have symptoms such as blurring of vision at night or halos or intermittent eye ache. A smaller proportion develop an acute attack of angle closure (see later). This can be prevented with timely diagnosis and preventive treatment.

How common is angle closure?

It is estimated that of approximately 60 million people worldwide with glaucoma, 15 million people (1 in 4) have angle closure glaucoma. Compared with open angle glaucoma, which causes bilateral blindness in around 10% patients, angle closure glaucoma may progress more quickly. It is estimated that blindness in

both eyes affects around 25% of patients (around 4 million people) with angle closure glaucoma worldwide. In western countries around 10-15% of glaucoma is due to angle closure.

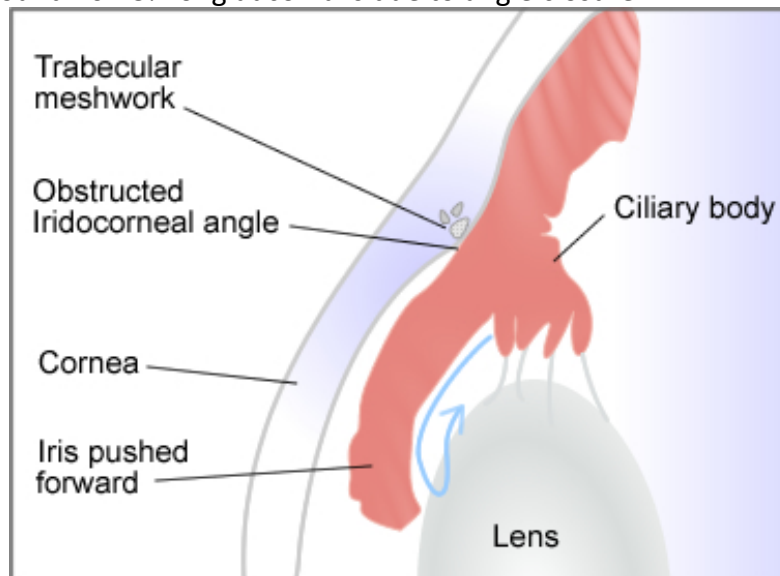


Figure 3. Mechanism of angle closure. Aqueous cannot access the drainage channels due to blockade at the pupil due to iris touching the lens and causing collection of aqueous behind the iris, forward bowing of iris and closure of the angle.

Why and in whom does angle closure occur?

Angle closure is a consequence of the size and shape (anatomy) of the front of the eye (Figure 3). People with angle-closure have smaller than average eyes, from front to back. This can only be determined by medical examination- it is not possible for you to look at your own eye and decide if it is small or not. When there are no other diseases associated with the condition this is called primary angle closure. The majority of cases of angle closure are due to primary disease. Angle closure is more commonly seen in people with a dark brown, naturally thick iris and a thick lens. It is also more common in those with long sightedness (hyperopia). Those most commonly affected are the elderly (over 60 years), Asian people and women.

Some other eye diseases can also cause closure of the angle; this is called secondary angle closure. This can result from the iris being pulled forward due to inflammation (uveitis) or uncontrolled diabetic eye disease, which causes the iris to stick to the cornea. A swollen or dislocated lens can also push the iris forward.

Acute Primary Angle Closure Attack

This is a sudden closure of the iridocorneal angle leading to a rapid and often severe rise in pressure inside the eye. The sudden increase in pressure causes a very painful eye that is often red. The pain can present as a headache or even stomach ache or tooth ache. Patients may experience nausea and vomiting. Vision is often blurred, with coloured haloes around lights. The pupil is dilated and does not shrink when exposed to light.

Acute primary angle closure is an eye emergency; the rapidly rising pressure inside the eye can cause damage to different parts of the eye, and lead to permanent loss of vision. Urgent treatment is required if further damage is to be prevented. Patients suffering from these symptoms should seek immediate medical

attention rather than waiting to be seen at a more convenient time.

Acute angle closure episodes can also occur intermittently particularly in the dark or at night. Acute attacks can be precipitated in the predisposed individuals by the use of certain medicines (e.g. for asthma, stomach upsets, depression, cold & flu remedies, travel sickness and bladder problems) as these dilate the pupil or alter the behavior of the muscles inside the eye. Acute attacks may occur after eye drops are used to dilate the pupil for eye examinations (such as examinations for diabetes or retinal problems).

Treatment of acute primary angle closure

The aims of treatment are to: -

1. Control the eye pressure and any symptoms of pain or vomiting
2. Open the angle, using either laser or surgical procedures
3. Monitor and prevent damage to the optic nerve and preserve vision.

Patients may even be admitted to hospital until the intraocular pressure has been reduced and stabilised. Treatment initially involves eye drops and pills to lower the eye pressure. Medication may be given as an injection through a vein in some cases. Painkillers will be given as needed.

Eye pressures will be checked regularly and if no improvement occurs or after the pressure is reduced then a procedure called peripheral iridotomy or peripheral iridectomy is performed. This creates a new channel for aqueous flow and relieves the blockage at the pupil (Figure 4). Iridotomy is performed using laser in most cases, although occasionally surgery is required. Further medications or sometimes-even surgery in the form of lens extraction or trabeculectomy is required to control the pressure.

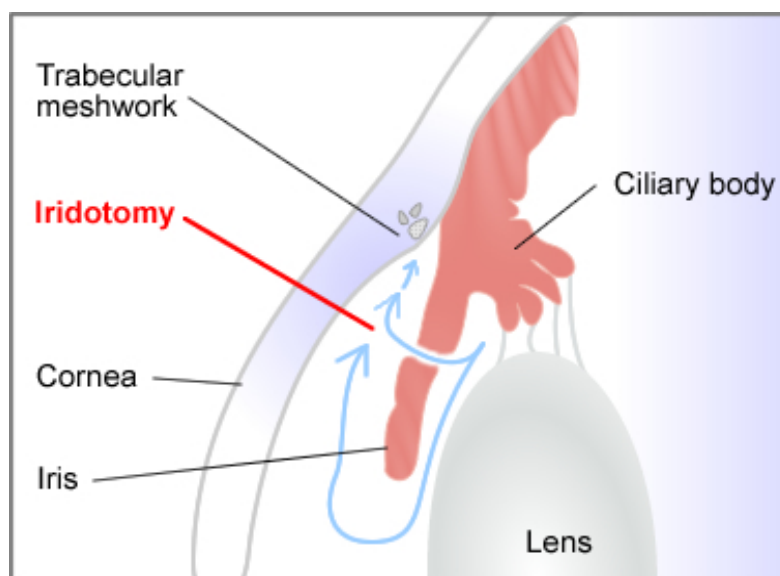


Figure 4. Iridotomy to relieve pupil block and angle closure. This balances the fluid pressure in front and behind the iris allowing the fluid to flow more freely inside and out of the trabecular meshwork.

Chronic Primary Angle Closure

Chronic primary angle closure is much more common than acute primary angle closure and is largely asymptomatic. It is also a more frequently blinding condition, as the patient is not aware of a problem until late in the course of the disease. Chronic primary angle closure can develop into acute angle closure if a sudden worsening of the closure occurs.

Staging of chronic primary angle closure

The staging of angle closure is done based on the findings of eye examination including gonioscopy, eye pressure and optic nerve. The stage of angle closure is important to determine its treatment and monitor outcomes.

a. Primary angle closure suspect (PACS) or “narrow angles”

The iris is pressing on the trabecular meshwork (drainage channels) but has not begun to stick, eye pressure is normal, and there is no damage to the optic nerve. The risk of sight loss is estimated at 1% per year. Currently, laser iridotomy is recommended in this stage of the disease. Success rates for iridotomy opening the drainage channels are around 75%. If the drainage channels do not open up after iridotomy, there is a range of treatment options, including laser iridoplasty or pilocarpine eye drops.

b. Primary angle-closure (PAC)

Established disease has taken hold causing scarring and/or an increase in eye pressure. The risk of sight loss from glaucoma is estimated at 30% over 5 years. It is possible to control the disease using laser iridotomy in less severe cases. More advanced cases require further medication, laser or surgery.

c. Primary angle-closure glaucoma (PACG)

In this final stage of the disease, damage to the optic nerve has already occurred. Sight loss will probably have started, although few people are aware of this until it is at an advanced stage. Management of the disease will often involve laser treatment and eye drops. Surgery may be required, but care must be taken, as standard glaucoma surgery can have serious risks of complications in angle-closure glaucoma.

Management of chronic primary angle closure

The aim of treatment is to prevent progression of chronic primary angle closure causing rise in pressure and damage to the optic nerve and ultimately visual loss. There are several treatment options and often a step wise approach will be used by your eye specialist depending on your individual condition.

- Laser peripheral iridotomy - this is the first line, definitive treatment of chronic angle closure. A small (0.2 to 0.5mm) hole is made in the iris close to the junction between the white and clear parts of the eye (where the sclera and cornea meet)
- Laser iridoplasty - this is a second line laser treatment used to tighten the iris, and pull it away from the trabecular meshwork drainage channels. This feels slightly more uncomfortable during the

procedure than laser iridotomy and takes longer to settle.

- Medication - a variety of different eye drops can be used to treat angle-closure. The need for long-term use of these medications can only be decided after laser treatment has been performed to open the iridocorneal angle.
- Lens extraction surgery - If cataract (cloudiness of the natural lens) is present then its removal and replacement with a plastic intraocular lens is a highly effective option in the management of angle closure. This can be used as the first treatment for angle-closure combined with cataract. If laser iridotomy, laser iridoplasty and medical treatments for angle-closure have not been fully successful, then clear lens extraction (i.e. cataract operation prior to the formation of cataract) can be used. Recent evidence from multicenter randomized trial (EAGLE) favors clear lens extraction as first line in patients with angle closure glaucoma or those with very high pressures. Removing the lens creates a lot more space inside the front chamber of the eye, and allows the iris to fall away from the trabecular meshwork drainage channels. In some cases particularly in the early stages of the disease, this fully “cures” the condition.
- Trabeculectomy - This is an operation to create a new aqueous drainage channel, from inside to the outside of the sclera (the white of the eye). It may be necessary in some cases where other treatments have failed or are not suitable. This procedure should only be carried out by a specialist glaucoma eye surgeon.

Preventing Angle Closure Glaucoma

People at particular risk are those over the age of 60, women, Asian people and hyperopes (long sighted). If you are in two or more of these groups, you should ask your optician or ophthalmologist to specifically look for and exclude angle-closure. Relatives of people with angle-closure have a 1 in 3 risk of having the disease themselves. Angle-closure is uncommon before the age of 40. If you have an affected relative and are over the age of 40, you should consult your optician or ophthalmologist.

Angle-closure can **only** be confirmed by gonioscopy (a special examination with a contact lens). Anterior segment OCT (Optical Coherence Tomogram, a special scan of the front of the eye) is similar to ultrasound, but uses light. OCT scans have been widely used in research into angle-closure, and can now be used in the diagnosis and monitoring.

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Contact Information and Further Reading

If you have any further question or would like to discuss the information in this leaflet with someone please contact:-

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For emergencies: St. Thomas' Hospital has a weekday (8.00am-4.00pm) Eye Emergency Unit and out of hours Accident and Emergency.

Eye Emergency reception can be contacted on 020 7188 7188 and ask for eye casualty

Thank you for reading this information sheet and being better informed about your eye care!