NHS
Oxford University Hospitals
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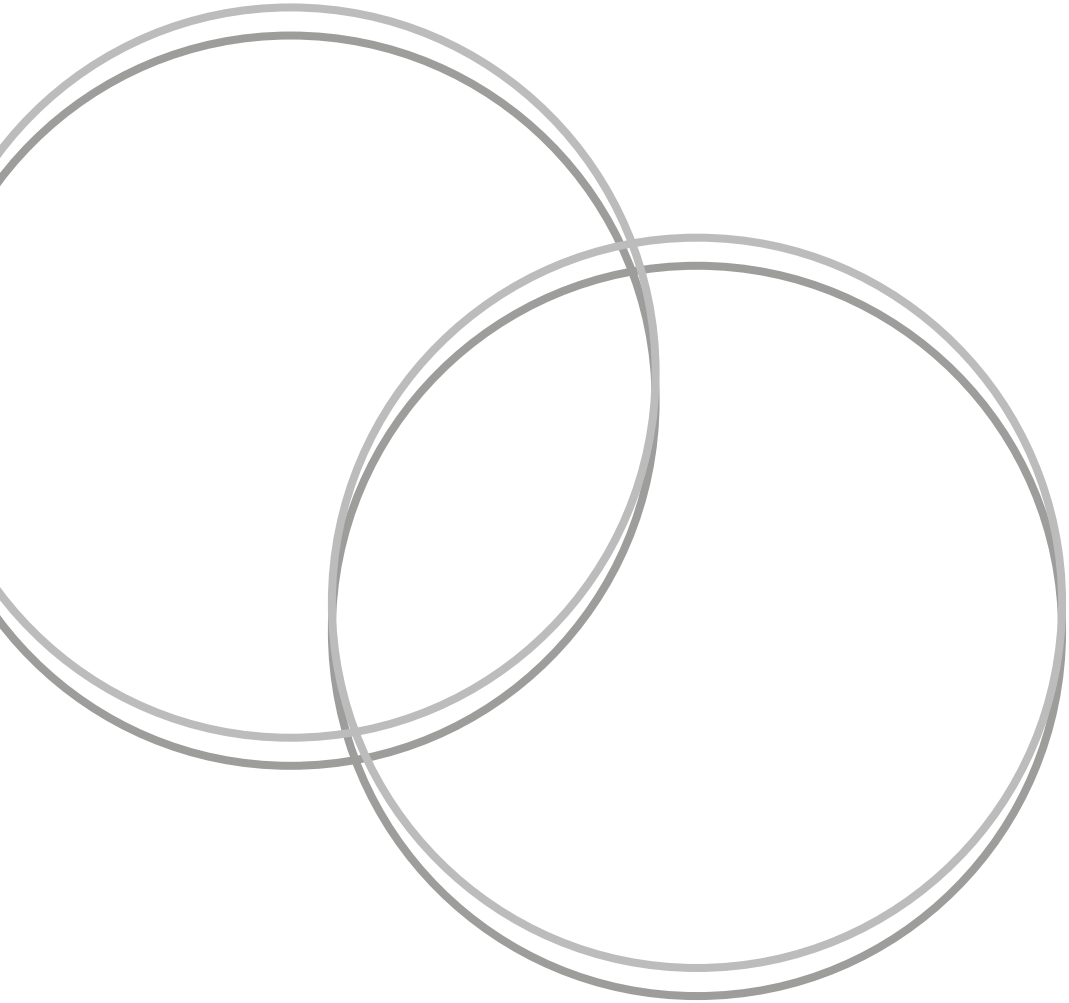
Glaucoma Tube (Aqueous Shunt) Surgery

Information for patients



You have been advised by your glaucoma specialist to have an operation to reduce the pressure (intraocular pressure - abbreviated to IOP) in your eye. This leaflet provides you with information to help you decide if you would like to go ahead with surgery and what to expect after surgery. If you have any questions about the operation or if there is something in this leaflet that you do not understand, please write it down and make sure you get the answers you need at your pre-operative assessment appointment or on the day of surgery, before you give your consent for the procedure.

It has been recommended that you have this operation because your eye pressure is too high and/or your glaucoma continues to worsen despite the use of eye drops or when standard glaucoma surgery (trabeculectomy) has failed, cannot be performed or is likely to fail.

The success of the operation relies heavily on the after care and healing process. Careful monitoring of your eye after the operation and making the right adjustments to your treatments can have a significant effect on the long-term success of the surgery. Similarly, you have a role to play in improving your chances of a successful outcome by following all the advice given. You should remember that the operation may not begin to work effectively straight away and you may still need to take some eye pressure medications. The tube may also need to be adjusted, involving a second smaller operation, but this would usually only be required within the first year.

You should also remember that this operation will not improve your vision or ‘cure’ your glaucoma. The main aim is to slow down (as much as possible) further vision loss from glaucoma.

What is an aqueous shunt (tube)?

The surgery is referred to as 'tube surgery' as it involves placing a small surgical implant made of silicone, with a very fine tube, into your eye to allow drainage of fluid. This should help reduce your eye pressure and reduce the number of glaucoma eye drops you need to use. You should be aware that the devices used for the operation maybe referred to by many different names including valve, aqueous shunt, drainage implant, drainage device and filtration device. You should consider all these terms to mean the same thing.

The main type of tubes used are the Baerveldt tube (Figure 1) and Paul tube - both of which are non-valved (as they let fluid flow through freely). The other type of tube less commonly used is an Ahmed valve which is valved (a valve within the tube controls the amount of fluid drained out of the eye).

The Baerveldt and Paul tube are made of silicone and consist of a tube (less than 1mm in diameter) and a base plate. The open end of the tube, which is cut to fit your eye, is placed within the front chamber of the eye. The function of the tube is to drain fluid (aqueous humor) from within the front chamber of the eye to the plate and thereby lower your eye pressure.

Figure 1a: Baerveldt tube.

Figure 1b: Baerveldt tube attached to eye.

Base plate tube

The base plate, at the other end of the tube, is placed on to your eye (as shown in Figure 1b) underneath a layer called the tenons (part of the skin of the eye) and between the eye muscles. The base plate sits well behind the eyelids and will not usually be seen.

The base plate forms the area or 'reservoir' where the fluid will collect before being absorbed into the blood stream. If the Baerveldt or Paul tube are inserted, the reservoir may not fully form straight away. This is to prevent the flow of fluid being too high during the first 6 weeks, as the eye pressure can go dangerously low if too much fluid is drained rapidly. In order to prevent this, the Baerveldt and Paul tube need to be blocked with a cord stent (sometimes referred to as a stitch, suture or cord) placed within the tube. Furthermore, a stitch is sometimes placed around the tube to further restrict flow and can later be removed by laser treatment in clinic if further lowering of eye pressure is required.

The part of the tube that sits on the surface of the eye needs to be covered to prevent the breakdown of conjunctiva (a thin, clear membrane that protects your eye) overlying the tube. This can be done using either a patch of tissue from an eye bank (donated cornea or sclera) or commercially prepared tissue (pericardium or sclera).

All mentioned tissues are actually dead, and therefore, do not have the usual risk of rejection that can happen with living donated tissues. In addition, all tissues are carefully tested for infectious diseases including syphilis, Hepatitis B and C and HIV, but they cannot be tested for something called a prion disease (most commonly referred to as 'mad cow disease'). However, there have been no reported cases of prion disease from glaucoma surgery.

From 6 week onward to around 2 to 3 months after the operation (or in some cases sooner), the cord stent MAY be removed from the tube to allow the tube to function fully on its own. This is performed on about two thirds of patients having tube surgery. If your stent is not removed within this period there is still a small chance it will need removing at a later date. The cord stent is usually removed in the operating theatre, although this is a minor and relatively quick procedure.

The Ahmed valve is a valved silicone tube. The benefit of the valve is that the tube will start draining fluid from the eye from day 1 and reduces the risk of the tube over-draining and having the potentially dangerous complication of the pressure going too low.

Mitomycin C (MMC)

During the surgery, the drug Mitomycin C (MMC) is SOMETIMES applied to the surface of the eye for 3-5 minutes and then washed away. Mitomycin C is a drug that was originally used to treat cancer and is used for glaucoma surgery to reduce scarring. Scarring is the main cause of the surgery failing and Mitomycin C helps to reduce scarring and therefore surgery failure.

The likely benefits of the operation

The surgery is intended to help preserve your vision, by slowing down the glaucoma damage, over the long term.

There have been several large studies comparing the outcomes of tube surgery. At approximately five years after tube surgery, the surgery resulted in an average drop of eye pressure by 58% and an average reduction of the need to use drops by 50%. In addition, approximately 13% of patients did not need drops to control their eye pressure. However, about 43% of patients needed eye drops to control their eye pressure.

What if I decide not to have the operation?

You have been offered this operation because the pressure in your eye is too high or your glaucoma is getting worse despite being treated with the maximum amount of tolerated eye drops. Therefore, if you decided not to have this operation there is a risk that you may lose more vision or go blind from glaucoma. Blindness from glaucoma is irreversible.

There may be other options for treatment that do not involve tube surgery. However, it is likely that your glaucoma specialist considers that these would not be enough to treat your condition. Your glaucoma specialist will be happy to discuss other options and explain the chances of their success compared to tube surgery.

You should not feel that you are being forced into having this operation, and you will be given as much time to think about it as you need. You should remember however, that any delay in treatment may be causing irreversible damage to your eyesight.

What are the risks from having the operation?

Below are the risks of surgery:

High pressure - This is not uncommon after the operation and will require you to restart some drops and sometimes tablets to lower your IOP. You should remember that this is not a sign that your operation has failed as the IOP lowering effect of the Baerveldt and Paul tube may not start immediately after surgery. If the pressure remains high between 2 to 6 weeks after surgery, then your surgeon may laser the stitch around the tube (if present). Beyond 6 weeks, if your IOP is still high, then your surgeon will discuss the option of adjusting/removing the stent from your tube to allow more drainage. If the pressure is very high immediately after the operation, it may be that the tube is blocked (for example, by a blood clot) and may require surgery to move the blockage.

Low pressure - If too much fluid is passing through the tube then the pressure can go very low. If this occurs, your vision may become blurred and you may experience discomfort in your eye. This is particularly a risk if you do not rest and allow your eye to recover after the operation. Low pressure increases the risk of a major bleed inside of the eye and can also reduce your vision. It may be necessary to take you back to operating theatre urgently to place a stitch around your tube to reduce the flow or to inject a gel into the eye in order to increase the eye pressure. The published data suggest that up to 5% of patients require a return to surgery to treat the low IOP.

Infection - Infection inside the eye can be a devastating but rare (approximately 1 in 1000) complication of any eye operation. The risk with tube surgery is thought to be less than other eye operations, although exact figures are not known at this time. Every possible measure is taken to reduce the risk of infection during the operation and we would encourage you to be careful to keep the eye clean and use the antibiotic drops you will be prescribed after the operation. Early symptoms of infection include blurring of vision, increased pain, increasing redness and discharge from the eye. If you have any of these then you should contact the Emergency Eye Department on the same day (contact details at the end of this leaflet).

Risks of tube surgery

Bleeding - Bleeding is a risk with any operation. Bleeding in the front chamber of your eye usually stops on its own. This blood will usually dissolve away on its own, but if it doesn't, it can be washed out with a minor operation. Bleeding at the back of the eye (which is rare) can be much more dangerous and can result in complete loss of vision. The main risk factor for this happening is when the pressure is very low in the eye.

Double vision - Due to the size of the tube implant and its position near to the muscles that control eye movement, it is possible that it can affect your eye movements resulting in double vision. Studies looking at this complication of surgery have found that up to 5% of people experienced double vision after tube surgery which can be either horizontal, at an angle or above and below. If you do develop double vision, then it usually settles. If the double vision does not settle, then you may need to have a prism fitted into your glasses to balance the 2 eyes up. Very rarely, for persistent double vision, the tube will need to be removed.

Cosmetic effect - Very occasionally the tube, patch graft or drainage reservoir can be seen on the surface of the eye. This is often only when the eye is looking into the extremes of gaze (moving the eye very far to the right/left/up/down) Care is taken to make these areas hidden under your eyelid, but in some circumstances the tube surgery may be visible.

Erosion of the tube - As discussed previously, a patch of tissue is used during the operation to protect the tube, but erosion remains a small risk. Published data at 5 years after surgery has reported tube erosion to occur up to 4% of patients.

Damage to the cornea - Sometimes the tube can rub against the inside surface of the cornea, which may cause the cornea to become cloudy. This will usually be spotted by your glaucoma specialist before it becomes a problem and the tube can be re-positioned with a minor operation. Sometimes the cornea can become cloudy even if the tube is well placed. At 5 years, clouding of the cornea has been reported to occur in up to 12% of patients undergoing any tube surgery. If the cornea remains cloudy then you may need to see a corneal specialist.

Blurred vision - Your vision will be blurred after the operation and should improve gradually over a period of several weeks back to its usual level.

Cataract (clouding of the lens in your eye) - If you have already had cataract surgery then this will not be an issue. If you have some cataract, then we may operate on this before your tube surgery. If you have no significant cataract before the operation then the surgery may cause cataract to form earlier than it would have done otherwise. In an eye that has had tube surgery, a cataract can be dealt with in the usual way.

Failure - At 5 years, the published failure rate (i.e. further treatment or surgery is needed to control your glaucoma) has been shown to be up to 53%. If your tube fails, the options available to you will be discussed by your glaucoma specialist. It is possible to repeat the operation and a patient can have more than one tube in their eye at the same time if needed.

Droopy eyelid - After any type of eye surgery, the upper eyelid may droop down towards the pupil. This is usually a temporary problem that resolves within a few weeks to months. If it doesn't resolve and is causing a problem then the eyelid position can be changed with a small operation.

Before the operation

Your surgeon will discuss the anaesthetic options for your operation. The majority of patients have their operation under 'general anaesthetic', whereby the patient is put to sleep. If you are to have a general anaesthetic then you will need extra tests as part of your pre-operative assessment. In some circumstances you may be offered a 'local anaesthetic' whereby the anaesthetist numbs the eye and surrounding tissues with an injection and the operation is done whilst you are awake. However, we usually give some medication to make you "sleepy" but you will not be asleep (sedation). The majority of patients are safe to go home a few hours after the operation.

You should continue all drops and tablets until the morning of your operation. You should also take all of your tablet medication. If you on blood thinning medication, the pre-operation team will advise you on what to do with it before your surgery.

You will have an appointment for a pre-operative assessment with one of the specialist eye nurses. The main reason for this is to check your general health, but it is also an opportunity for you to express any concerns or ask any questions about the procedure.

Please remember to bring a full list of any medications to this appointment.

What should I expect on the day of the operation?

Your surgeons may examine your eye and talk to you again about the operation before asking you to sign the consent form (if not already done so).

The operation will take up to 2 hours.

If you are having local anaesthetic with sedation then you will be given sedation and then the anaesthetic doctor will numb your eye with some eye drops followed by an injection of some anaesthetic around your eye. This is not painful but you may experience a pressure sensation as the anaesthetic goes in. The anaesthetic not only numbs your eye, but also relaxes the muscles around the eye and makes the vision blurred. You may therefore have some blurred vision and double vision after the operation until the anaesthetic wears off. If you experience any discomfort during the operation, then you should raise your hand slowly and the surgeon can stop and top-up your anaesthetic.

Your eye will be cleaned and a sterile plastic sheet called a drape will be placed over your eye and will cover your head and face. If you are awake for the procedure, the drape will be held away from your nose and mouth and air will be circulated under the drape. Also, if you are awake for the operation, you will hear the doctors and nurses constantly talking to one another. This is normal and you should not be concerned by it. If anyone needs to speak to you directly then they will address you by your name.

At the end of the operation an eye pad and shield will be placed over the eye to protect it. This should be worn overnight and removed the next morning. If you have very poor vision in the non-operated eye then we can avoid padding the operated eye.

You will be given some eye drops and full instructions on how to use them. We will go over this again at your first check-up appointment.

If you are using drops for your other eye then you should continue to use these after the operation. If you are not sure then please ask a nurse or doctor for advice on this.

The vast majority of patients go home on the same day as the operation. It is generally advised that you ask a relative or friend to accompany you home, especially if your sight is poor in the other eye. If you have had a general anaesthetic or sedation, you will need to have someone to stay with you overnight in case there are any problems.

What should I expect after the operation?

The eye is normally padded and a plastic shield is placed over the eye after surgery. The next day the eye pad and shield should be removed and the skin around the eye should be cleaned with cool boiled water. The pad can be disposed of, but the shield MUST be worn over the eye at night for 2 weeks. If you have poor or no sight in your other eye then we may take the pad off before you go home.

How should my eye feel or look like after the surgery?

After the operation, the eyelid on the operated eye may be droopy for the first 1 to 2 months. The eye will be "red/bloodshot" for the first 4 weeks then this will settle. This is quite normal. It is normal to feel itching, sticky eyelids and discomfort/soreness for a while (3 to 4 weeks) after surgery due the surgery itself and partly due to the stitches. If you have soreness/discomfort, we suggest that you take a pain reliever such as paracetamol every 4 to 6 hours (maximum 8 tablets/4g in 24 hours) providing there is no medical reason why you cannot use it.

Please don't rub your eye. The vision may be blurred after the surgery for the first few weeks and then start to improve. It can take up to 3 months for the vision to stabilise and sometimes a change of glasses prescription is required.

Eye drops after the surgery

After the surgery, **initially all glaucoma drops to the OPERATED EYE ONLY and acetazolamide (if being used) are usually stopped**. If you are using glaucoma drops for your other eye, these MUST be continued as normal.

Eye drops to the operated eye should start on the morning after the operation. It is likely you will be given 3 different drops. Each drop comes in individual vials – **please either use ONE VIAL per day (Chloramphenicol and atropine) or UNTIL it runs out (Dexamethasone). It is important to leave a minimum of 5 minutes gap between any drops**. You will be prescribed:

Antibiotic drop (Chloramphenicol preservative free): This is given four times a day and is to reduce your risk of infection. You will usually need to use this for 3 weeks.

Steroid drop (Dexamethasone preservative free): This is to reduce inflammation and therefore the risk of scarring which can lead to failure of the surgery. The drop needs to be used for the majority of patients every 2 hours (during the day only) usually for the first 3 to 4 weeks and then the drops are slowly reduced over 2 months at the surgeon's discretion. You must NOT stop the steroid drops suddenly as your operation may fail. Make sure you do not run out of drops. If more drops are needed, these can be obtained from your GP.

Pupil dilating drop (usually Atropine): This drop is SOMETIMES prescribed for patients who MAY develop complications if the IOP goes too low. The drop makes the pupil big and can protect the eye against low pressure. The drop is usually prescribed to be used twice a day and is used for the first 2 to 3 weeks (sometimes longer). The drop will make your pupil look bigger compared to the other eye and will blur your vision. However, once it is stopped the pupil and vision will return to normal, usually within 10 to 12 days.

Post-operative clinic visits

You will usually be seen on the day of the operation and sometimes the next day. Patients are then usually seen one week after surgery in the Eye Hospital Outpatients Department when further follow-up appointments will be planned. However, you may need to be seen more frequently if the eye pressure is too high or too low.

During your follow-up visits, if the IOP is too high, you may either be restarted on glaucoma drops and or have laser to the stitch around the tube (if applicable). The laser is performed as an outpatient procedure usually on the day you are seen and involves putting a numbing drop (anaesthetic) in your eye and using a special lens, the stitch around the tube is lasered. The procedure is quick and painless.

If after 6 weeks of follow-up, the IOP remains high, you may need either the cord inside the tube adjusted or removed in total. This minor operation is performed either in the clinic or theatre under local anaesthetic.

Activity after surgery

It is important to avoid strenuous activity during the early period after surgery including swimming, tennis, jogging and contact sports. Watching TV, reading and using a computer will not harm the eye. Avoid activities involving bowing your head down and activities such as yoga that require head down posturing.

If the eye pressure is very low then your surgeon may ask you to avoid all activities that involve any exertion.

Avoid wearing make up for the first four weeks.

When can I go back to work?

The duration of time needed off work will depend on a number of factors such as the nature of your job, vision in your other eye and the IOP in the eye that had surgery.

In general, if you work in an office environment you would need 2 weeks off work if you have no complications after the operation. However, if your occupation involves heavy manual work or working in a dusty / outdoor environment you are likely to require one month or sometimes more, off. This can be discussed with your consultant.

Contact lens use after surgery

Avoid contact lens wear for the first four weeks after surgery. After this you will be advised by your surgeon when to start wearing contact lenses.

Flying after surgery

Although it is safe to fly after surgery, as you will need close follow-up for the first few months, it is recommended that you avoid travel in the first 3 months after surgery.

When will my eye be back to normal?

In the majority of cases, it takes 2 to 3 months for the eye to feel completely normal and sometimes longer in more complicated cases.

DOs and DON'Ts

Please take some time to familiarise yourself with this list (some of the points will already have been mentioned), as the success of your operation may depend on it.

- Treat the other eye with its usual drops.
- Attend your follow-up appointments. Your surgery is likely to fail and you could suffer irreversible vision loss if you miss appointments.
- Seek urgent attention if you suffer from increasing blurring of vision, increasing or exceptional pain, increasing redness, thick discharge from the eye or the appearance of pus in front of the iris inside your eye when you look in a mirror.
- Avoid strenuous activity (including sex, sports, jogging, swimming, going to the gym, digging, and any bending/lifting) for two weeks and ask your specialist before re-commencing any of these activities. Walking and light household chores are not restricted. Watching television and reading are also not restricted.
- Wear the eye shield at night for the first two weeks to avoid any accidental injury to the operation site. Try to sleep on the opposite side to your surgery or on your back.
- Use the medications as prescribed and make sure you understand any changes made at your follow-up visits. Your consultant is always happy to write these down for you or speak with your carers where necessary.
- Avoid contact lenses (usually for at least 4 weeks).
- You can wear your glasses the day after surgery and you may wish to have some sunglasses available as the eye may be more sensitive to light than usual.
- You can fly after surgery, but please don't allow any trip to affect your follow up appointments.
- You can shower and wash your hair but be careful not to allow any water to get in your eye.
- Driving after the operation depends on several variables and is different for each individual. You should plan to avoid driving for 2 weeks.

The following may require urgent attention

- blurring of vision
- increased pain
- increasing redness
- discharge from the eye.

Call our specialist telephone triage number:

Telephone: **01865 234 567** option 1

Monday to Friday, 8.30am to 4.30pm.

Saturday and Sunday, 8.30am to 3.30pm (including Bank Holidays)

You will be able to speak to an ophthalmic health professional who will advise you.

If you need advice out of hours, please phone NHS 111 or your out of hours GP practice.

Further information

Further information about treatment for glaucoma may be found on the NHS conditions website: www.nhs.uk/conditions

Further information

If you would like an interpreter, please speak to the department where you are being seen.

Please also tell them if you would like this information in another format, such as:

- Easy Read
- large print
- braille
- audio
- electronic
- another language.

We have tried to make the information in this leaflet meet your needs. If it does not meet your individual needs or situation, please speak to your healthcare team. They are happy to help.

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