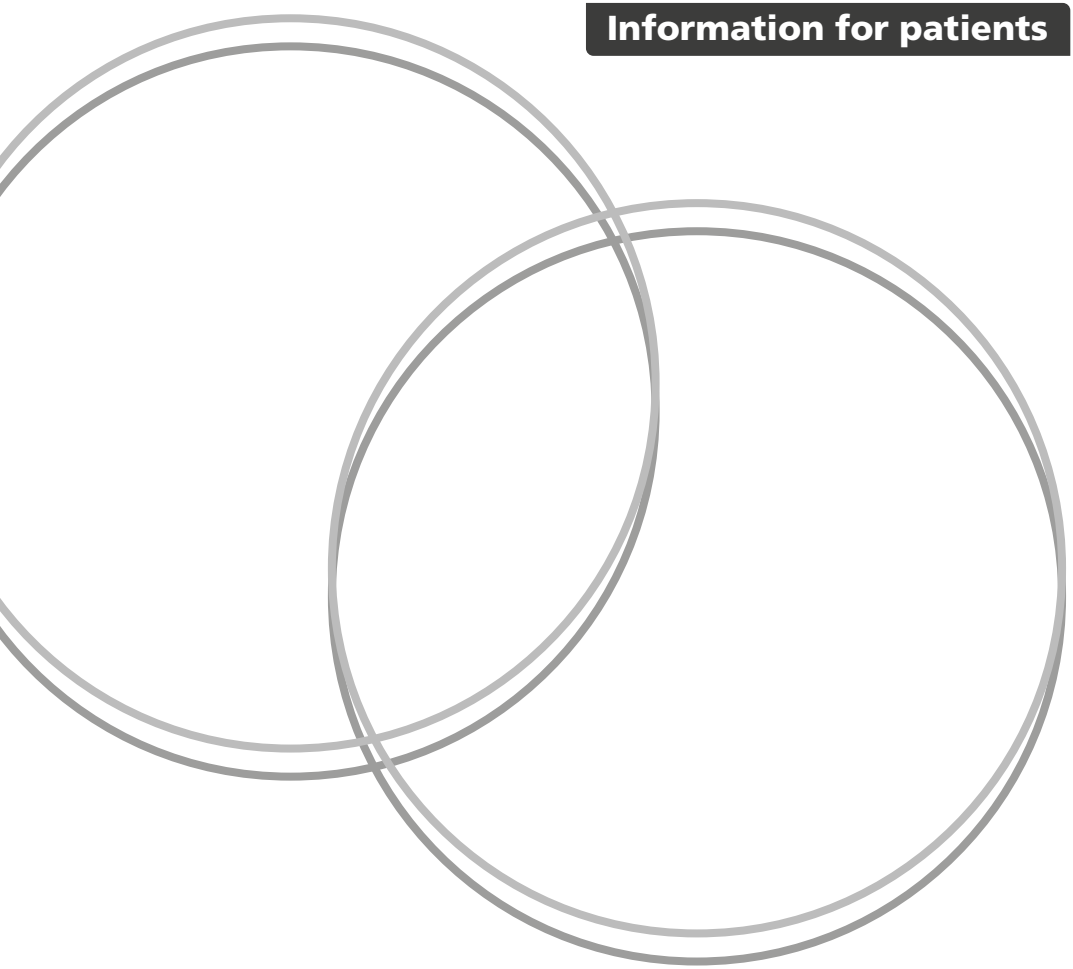
NHS
Oxford University Hospitals
NHS Foundation Trust

Corneal Transplantation: Endothelial Keratoplasty (EK)

(including DSEK/DSAEK and DMEK)

Information for patients



Understanding the cornea

The cornea is the clear, curved "window" at the front of your eye. It lets light into your eye and helps you focus so you can see clearly. If the cornea becomes cloudy, light cannot pass through it properly, and your vision becomes blurred.

The cornea has three main layers:

1. **Epithelium** – This is the thin top layer. It protects your eye and keeps the surface smooth so light can focus clearly.
2. **Stroma** – This is the middle layer. It gives the cornea its strength and shape.
3. **Endothelium** – This is the deepest layer, on the inside of the eye. It is made of special cells that act like tiny pumps, removing extra fluid from the cornea.

If these pump cells stop working, fluid builds up in the cornea. This makes it swell (called oedema) and become cloudy.

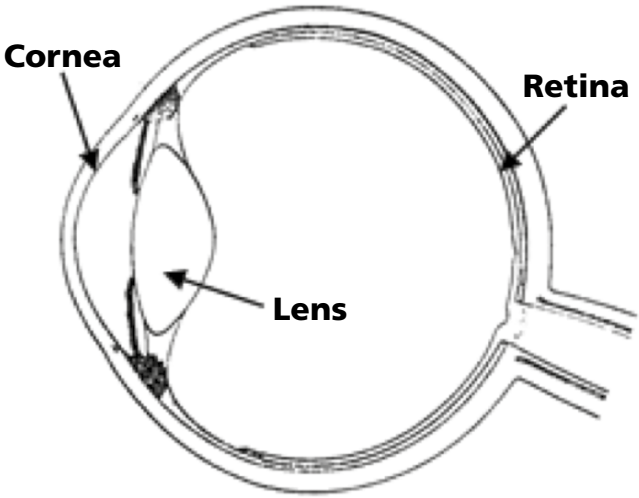


image reproduced with permission from Martin Leyland, Royal Berkshire Hospital

What is endothelial failure?

Endothelial failure occurs when the pump cells in the deepest layer of the cornea stop working properly. The cornea then fills with fluid, becoming swollen and cloudy, which causes blurred vision.

At first, this blurring may happen mainly in the morning, when your eyes have been closed during sleep. After you wake and open your eyes, the cornea gradually clears as the pump cells resume working. Over time, as the condition progresses, the cornea may stay cloudy throughout the day. In advanced stages, small fluid-filled blisters may form on the corneal surface. These can burst, causing discomfort or pain and increasing the risk of infection.

Causes of endothelial failure

The most common cause is damage following eye surgery, such as cataract or glaucoma operations. It can also occur in a condition called Fuchs' endothelial dystrophy, where the endothelial cells wear out too early. This usually affects both eyes and tends to appear between the ages of 40 and 60. Fuchs' dystrophy can run in families but may also occur without any family history.

What is Endothelial Keratoplasty (EK)?

Endothelial keratoplasty (EK) is an operation that replaces just the diseased inner layer of your cornea with healthy tissue from a donor. Unlike other types of cornea graft, the whole cornea is not replaced.

There are two main types of EK:

- DSAEK – Descemet's Stripping Automated Endothelial Keratoplasty
- DMEK – Descemet's Membrane Endothelial Keratoplasty

Both operations are effective, but they use slightly different amounts of donor tissue.

- DMEK replaces only the very thin inner membrane and can often give the clearest vision.
- DSAEK uses a slightly thicker piece of donor tissue, which is still very successful and may be more suitable in some situations.

Which one you have depends on your eye condition, the clarity of your cornea, your general health, and your surgeon's advice.

This diagram is a cross section of the cornea, showing the thin new donor graft on the innermost part of the cornea.

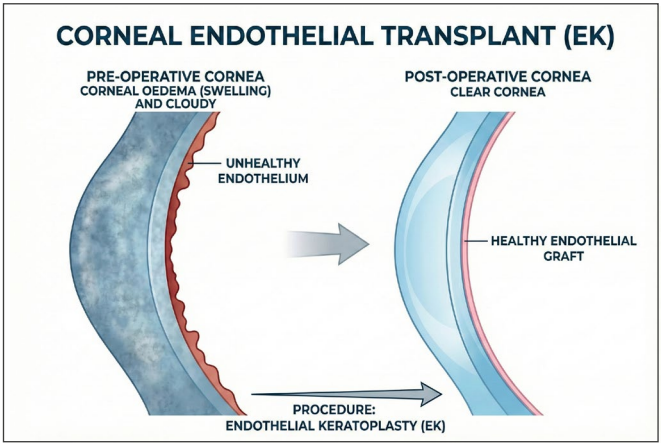


image created using Googlegemini

Donor cornea

Donor corneas come from people who have chosen to donate their eyes after death to help others. The donor or their family gives consent for this at the time of donation, often through a donor card or national register.

Unlike organs such as kidneys or hearts, corneal transplants do not need to be matched for blood group or tissue type. This means it is usually easier to find a suitable cornea, although there may still be a waiting period until one of the right quality becomes available.

All donor tissue is carefully screened for infections such as HIV and hepatitis. The cornea is also treated with an antibiotic solution before use. Although the risk is extremely low, not every condition can be detected, and therefore it is not possible to guarantee the donor tissue is completely free from infection. The risk of CJD (a rare brain disease) from corneal grafting is unknown but thought to be very small.

Only corneas that meet strict quality and safety standards are used by specialist eye surgeons.

Benefits of surgery

Most people notice an improvement in vision. Many see well enough to drive legally, though glasses are normally still needed. Vision may take up to six months to fully improve. Some people also find the eye feels more comfortable.

Possible risks and complications

All surgery carries some risks, although serious problems leading to loss of vision are rare.

The most common issue after this type of surgery is **graft dislocation**, where the new corneal layer does not attach to your cornea fully. This happens in about 1 in 10 DSAEK and 1 in 5 DMEK surgeries. If it occurs, this is usually detected at your 1 week review and your surgeon can usually reposition the graft by injecting a small air or gas bubble into the eye. This procedure, called a rebubble, can usually be done in the clinic or in theatre.

Other possible complications include:

Rejection of the donor cornea – when the immune system reacts against the new tissue. This occurs in around 6–10% of DSAEK cases within the first two years and is less common after DMEK. If treated promptly, rejection can usually be reversed, but it can happen at any time, even years later.

Graft failure – when the transplant becomes cloudy again. In approximately 1 in 200 cases, the graft does not clear initially. In others, the graft may gradually wear out over time. In both situations, another transplant (a "re-graft") can be performed if needed, although the risk of rejection and failure increases slightly with each new graft.

Raised eye pressure (glaucoma) – this may develop after surgery and is usually controlled with eye drops, but sometimes further treatment or surgery is required.

Cataract formation – clouding of the natural lens of the eye, which may later require cataract surgery.

Severe infection or bleeding inside the eye – these are rare (about 1 in 1,000) but can lead to permanent loss of vision.

Retinal detachment – where the light-sensitive layer at the back of the eye peels away. This is rare, but would likely require further surgery and could result in worsening vision.

Occasionally, the **donor tissue may be damaged** during preparation, meaning the operation cannot safely go ahead. If this happens, it will be postponed until suitable new donor tissue is available. If the tissue has a small defect but is otherwise healthy, the operation may still proceed, with a slightly higher risk of graft dislocation.

During surgery, it is rare for the graft to be damaged while being unfolded or positioned inside the eye. This can sometimes lead to early graft failure or shorten how long the graft lasts.

In some cases, small holes are made in the iris to help manage the air bubble used during surgery. This very rarely affects the appearance of the eye but can occasionally cause glare or double vision.

The operation

- **Anaesthetic:** You may have local anaesthetic (drops or an injection around the eye, sometimes with sedation) or a general anaesthetic.
- **Duration:** The surgery usually takes about one hour.
- **Procedure:** The damaged inner layer is removed and replaced with donor tissue. An air or gas bubble holds it in place. Sometimes a stitch is used.
- **Afterwards:** A protective shield will cover the eye. Most people go home the same day, though some may stay overnight.

You may be examined on the ward on the day of surgery and may need to have some of the air released from the eye if the pressure is high.

After the operation

- **Posturing:** You may be asked to lie flat on your back for 24-48 hours after surgery. This "posturing" helps the new graft to stick properly, as the air or gas bubble gently presses the tissue into place. You can get up briefly every hour for meals, toilet breaks or light movement.
- **Follow-up:** You will be seen usually one week after surgery. Further appointments will depend on how well your eye is progressing.
- **Vision:** Sight is blurry at first but should improve slowly.
- **Glasses prescription:** You will be advised when it is possible to see your optician for a new glasses prescription; this is usually around two months after surgery.
- **Stitches:** Some dissolve by themselves. Others may be removed later in the clinic.
- **Work:** Most people need at least one week off work. If your job is very physical, you may need longer. Avoid heavy lifting for 1 month.
- **Flying:** If air or gas is used in your eye, it is not safe to fly until your doctor says the bubble has gone.
- **Eye drops:** You will need to use antibiotic eye drops and anti-rejection (steroid) eye drops following surgery. The antibiotic drops are usually stopped at 2 weeks. The steroid eye drops are used for much longer (a year or more), as they guard against rejection. Duration: at least 12 months, sometimes longer.
  - At first: every 1–2 hours during the day
  - After 1 month: usually 4 times a day

You will be advised in the Outpatient Clinic how many drops to use, but please do not stop steroid eye drops unless advised to do so by the clinic doctor. **It will be necessary to obtain repeat prescriptions from your GP before your eye drops run out.**

Alternative treatments

If your vision is still satisfactory, it may not be necessary to have surgery straight away. Currently, there are no effective medical (non-surgical) treatments for endothelial failure. However, research into new treatments, such as special eye drops that may help the cornea heal itself, is ongoing.

In some cases, a **Descemet's Stripping Endothelial Keratoplasty (DSEK)** may be recommended instead of DMEK. This is similar surgery but uses slightly thicker donor tissue, which may be more suitable for certain eyes.

For more complex cases, or if previous grafts have failed, a **Penetrating Keratoplasty (PK)** – a full-thickness corneal transplant –may be the best option.

Symptoms of graft rejection

Rejection can occur at any time, even years after surgery. It is vital to seek urgent medical advice if you notice any of the following:

- Redness of the eye
- Sensitivity to light
- Sudden loss or blurring of vision
- Eye pain

Prompt treatment can often reverse the rejection, but delaying may cause permanent sight loss.

Contacting us

If you have a minor eye problem, please seek advice from your GP, optician or pharmacist.

Call our specialist telephone triage number if you need **URGENT** help or advice or if you notice:

- Redness and/or swelling of your eye lids and/or eyeball
- Any loss of sight
- Intense pain

Tel: **01865 234 567** and select the option for **Eye Emergencies**

Monday to Friday 8:30am – 4:30pm

Saturday and Sunday 8:30am – 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 NHS111 or your out of hours GP practice.

Further information

- NHS Website **www.nhs.uk**

Information sharing

To provide safe, high-quality donor tissue, information about your surgery is shared with **NHS Blood and Transplant (NHSBT)**, the organisation that supplies donor corneas in the UK.

If you do not consent to this information sharing, it may be more difficult to obtain suitable donor tissue or to contact you in the unlikely event of any later concerns.

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.

Author: Aisling Higham
November 2025
Review: November 2028
Oxford University Hospitals NHS Foundation Trust
www.ouh.nhs.uk/information

Leaflet reference number: OMI 116416