

CORNEAL TRANSPLANTS

All you need
to know



European Committee
on Organ Transplantation
(CD-P-TO)

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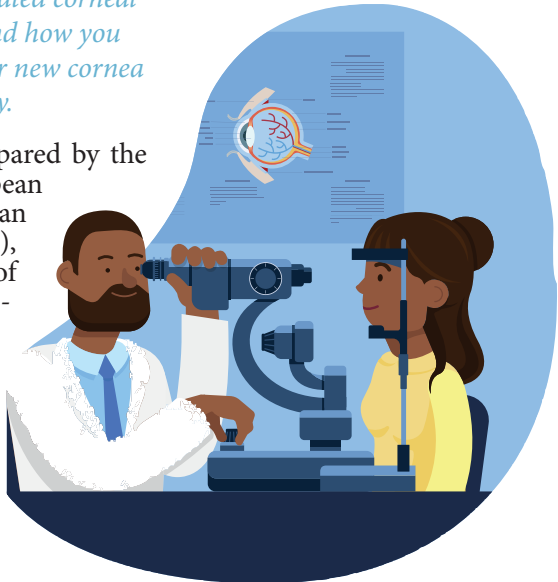
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INTRODUCTION

Your eye doctor and you have agreed that you need a corneal transplant. The cornea is the clear outer layer at the front of the eye that acts as a “window” to the eye and is essential for being able to see. To be functional, the cornea must remain transparent and round in shape. When the cornea is injured or diseased and no longer able to accomplish one or more of its key functions (transparency, focusing of images, structural support to the eye), a corneal transplant is needed to restore vision. A corneal transplant (also known as a keratoplasty) is a surgical operation to remove all or part of a damaged cornea and replace it with healthy tissue from a donor.

Most eye clinics offering corneal transplant procedures have their own written patient information. The aim of this booklet is to provide you and your family with general information on different corneal transplant procedures, where donated corneal tissue comes from, and how you should take care of your new cornea after surgery.

This booklet has been prepared by the Council of Europe European Committee on Organ Transplantation (CD-P-TO), which is composed of internationally recognised experts, in collaboration with the European Association of Tissue and Cell Banks (EATCB) and the European Eye Bank Association (EEBA).



WHY DO I NEED A CORNEAL TRANSPLANT?

The most common reason for needing a corneal transplant is to correct eyesight problems such as decreased or blurred vision, or glare from bright lights. Transplantation is sometimes used to treat a painful eye caused by blisters on the surface of the cornea or to treat urgent cases such as a very serious infection or inflammation of the cornea (keratitis) which, if left untreated, may result in further structural damage to the cornea (perforation). In these cases, corneal transplantation is needed to preserve the eye.

In very simple terms, the cornea consists of an outer (front) layer of cells (epithelium), a middle layer of connective tissue (stroma), and an inner (back) layer of cells (endothelium) on the thin Descemet membrane. These are shown in Figure 1.

Decreased function of the cells of the inner layer of the cornea is the most common condition that can be treated by corneal transplantation. This decreased function can be caused by an age-related disease called Fuchs endothelial dystrophy, by diseases that affect other parts of the eye such as glaucoma or

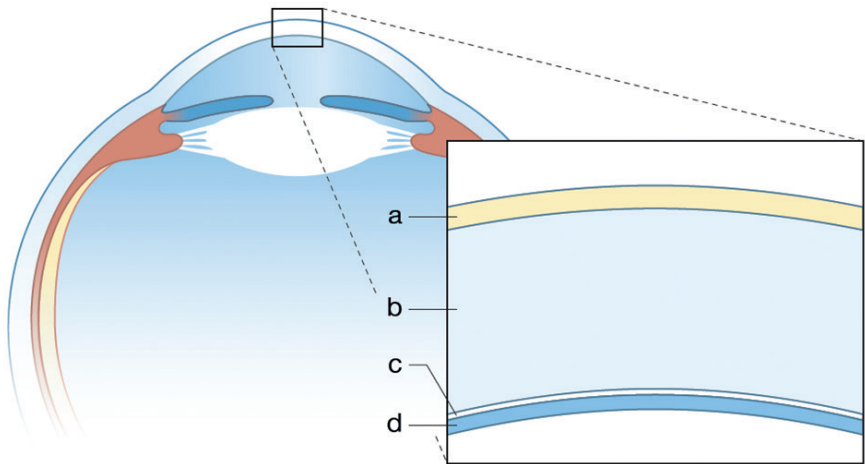


Figure 1 – Cross-section of the eye, with the cornea at the top. the magnified insert shows the different layers of the cornea: a) the outer layer (epithelium); b) the middle layer of connective tissue (stroma); c) the Descemet membrane; and d) the inner layer (endothelium), which is attached to the Descemet membrane.

by eye surgery such as a cataract operation. If the cells of the inner layer of your cornea do not function properly, your vision will gradually become more blurred and painful blisters could develop on your eye. The most common way of treating these diseases today is to replace part of the inner layer of the cornea using surgical procedures known as Descemet Stripping Automated Endothelial Keratoplasty (DSAEK) or Descemet Membrane Endothelial Keratoplasty (DMEK).

The middle layer of the cornea can become distorted or cloudy because of disease or due to corneal scars, which cause blurred vision. Where possible, these diseases can be treated with a partial corneal transplant, which preserves the inner layer of your cornea. If both the middle and inner layers of the cornea are affected, a procedure called full-thickness corneal transplantation is performed.

The most frequent conditions of the outer layer of the cornea relate to changes in the shape and thickness of the cornea, the most common example of which is keratoconus.

Your surgeon will provide you with full details about why you need a corneal transplant and which procedure is the most appropriate for you.

HOW WILL THE PROCEDURE BE PERFORMED?

Most corneal transplant operations are planned (“elective”) procedures. Patients with severe corneal disease, such as serious infections or perforations, are usually operated on as soon as possible.

Corneal transplantation is a microsurgical operation, which means it is carried out using a piece of equipment called an ope-

Is a corneal transplant my only option?

Corneal transplantation is only performed when there are no other medical or surgical treatment options available. It is always performed using healthy corneal tissue from a deceased human donor.

rating microscope. The procedure could last between 30 minutes and an hour and a half, depending on the transplant technique used. It can be performed under general anaesthesia (where you are unconscious) or local anaesthesia (where you are awake and the area is numbed), depending on your circumstances and the usual practices of your surgeon.

Corneal transplant surgery is generally performed on an outpatient basis: most patients enter the hospital or surgery clinic a few hours before their operation and leave the same day.

The most common corneal transplant techniques are briefly described on the following pages and illustrated in Figure 2. The type of corneal transplant you will be offered will depend on the parts of your cornea that need to be replaced.

Corneal transplantation has a very high success rate. This has much to do with the unique nature of the cornea itself, along with improvements in surgical techniques and corneal storage methods, making it less likely that your immune system will react against (“reject”) the transplant.

Full-thickness corneal transplantation

– Penetrating keratoplasty (PK)

During this procedure, which involves all the layers of the cornea, a circular piece of damaged cornea from the centre of your eye is removed and replaced with a similar piece from the donated cornea. Typically, the central part of the cornea is removed with a special round knife called a trephine and the donor cornea is held in place with thin nylon sutures (stitches). The sutures will typically remain for 12-18 months to allow enough time for the transplanted tissue to heal.

Deep anterior lamellar transplantation (DALK)

This procedure is usually performed if only the middle layer of the cornea is affected and the inner layer is healthy. The donor cornea is held in place with thin nylon sutures (stitches), as with a full-thickness transplantation. The sutures will typically remain for 12-18 months to allow enough time for the transplanted tissue to heal.

Posterior lamellar transplantation – (DSAEK and DMEK)

If just the inner layer of the cornea is diseased or damaged, only this layer is replaced. The surgery is performed through a small self-sealing incision that is made in the side of the cornea. The defective inner layer of the diseased eye is cut circularly, separated, removed, and replaced with a similar-sized circular section of healthy donor tissue that is then attached to the eye by an air or gas bubble, which will dissolve on its own after a few days.

WHERE DOES DONATED CORNEAL TISSUE COME FROM?

The donors

All tissue for corneal transplants comes from human donors who have died. All eye tissue is donated on a not-for-profit/non-financial gain basis and consent is given, either by the donors themselves before they died or by a family member who is authorised to give consent on their behalf. For this

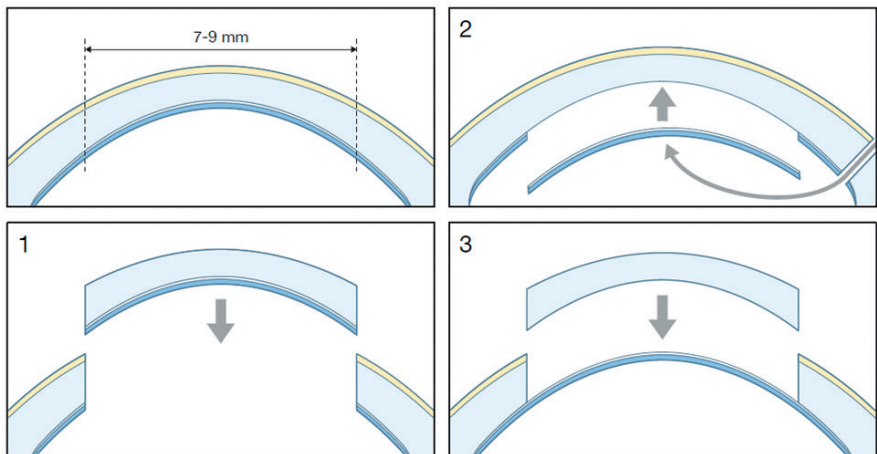


Figure 2 – The cornea. The upper-left image shows the normal cornea, which is about 12 mm in diameter. typically, a 7-9 mm section is transplanted as either 1) a full-thickness transplant (Penetrating keratoplasty); 2) a posterior lamellar transplant (DSAEK or DMEK); or 3) a deep anterior lamellar transplant (DALK).

reason, it is important that people discuss their wishes with their families. Your national health authorities or your eye doctor can tell you more about how tissue donation works in your country.

Donors and their relatives are protected by anonymity. This means that recipients of donated tissue are not able to contact the donor or their relatives directly, although in some countries the regulatory authorities may allow transplant recipients to send letters of thanks to the donor's family.

The role of the eye bank

After the donated corneal tissue has been removed and blood samples have been taken from the donor, the tissue and samples are transported to an eye bank, also known as "tissue establishment". The donated corneal tissue is analysed in detail and blood samples are tested.

Once the tissue has undergone a final quality check, it will be released and transported to a hospital to be used for corneal transplantation for a specific patient. Only corneal donor tissue from donors with no signs of transmissible diseases are used. In case of need, such as if unexpected occurrences take place after your transplant procedure, the eye bank will always be able to trace the source of a donated cornea, the substances used during their processing and the recipients of other tissues from the same donor.

HOW DO I TAKE CARE OF MY NEW CORNEA AFTER SURGERY?

After a corneal transplant, it is important that you follow the medical treatment as prescribed by your eye doctor. Your medication will usually be in the form of eye drops or ointment, but you may also be prescribed systemic treatment. You will usually need to take eye drops for up to one year after surgery. They help prevent infection or rejection of the corneal transplant. If the transplant has been attached using sutures, you should protect the operated eye by wearing a shield or glasses so that nothing bumps into or enters the eye accidentally.

It can take up to a year (sometimes longer) to fully recover from your procedure. Your vision will be blurry for the first

few months — and could, in some cases, be worse than it was before — while the eye gets used to the new cornea.

Corrective prescription lenses (glasses and/or contact lenses) that you might use for reading or driving may need to be changed after your corneal transplant. Your eye doctor will examine your eyesight in the weeks and months after the operation to measure the clearness of your vision (visual acuity) and will tell you if your prescription needs to be changed.



As your vision improves, you will be able to gradually return to your normal daily life. For the first few weeks after your operation, you should avoid strenuous exercise and heavy lifting. However, you should be able to return to work within a few weeks after surgery, depending on the specific nature of your job and how quickly your vision recovers.

It is important to follow your doctor's advice and attend regular follow-up appointments after surgery to minimise the risk of complications, which could cause permanent damage to your eye.

IS CORNEAL TRANSPLANTATION SAFE?

Most surgical procedures are routine, but no procedure is completely risk-free.

Experts working in eye banks are responsible for obtaining donated tissue and performing quality and safety control tests on it. They take every precaution to ensure that the corneas they distribute are as safe as possible. However, as with any material of human origin, the transmission of disease from the donor, such as infections, is extremely rare but cannot be completely avoided.

Although corneal transplantation is a very safe procedure, complications may arise during or shortly after surgery. The most serious complications are bleeding in the eye during the operation or infection in the eye in the early period afterwards. Both of these complications can lead to blindness, but fortunately they are very rare and occur in as little

as one in a thousand procedures.

If the operation involves suturing the donated tissue (PK or DALK), the sutures may loosen, which could lead to infection in the weeks and months following surgery. Symptoms are feeling like you have something in your eye (foreign body sensation), redness of the eye, pain and blurred vision.

If only the inner layer of the cornea has been transplanted (DSAEK or DMEK), the donated tissue may loosen in the first few weeks following surgery. The main symptom of this is your vision getting worse.

After all types of corneal transplant procedure, there is a risk that your immune system will reject the donated tissue. This can happen in the first weeks and months after surgery but could also happen years later. The risk is greatest in the first 2-3 years after the procedure. The main symptoms of rejection are your vision getting worse and often some redness of the eye.

You should contact your eye doctor immediately (same day or next day) if you develop any of the following symptoms:

- increasing foreign body sensation in the eye;
- redness of the eye;
- pain in the eye;
- blurred vision.

If necessary, corneal transplantation can be repeated. However, the chances of success are lower each time the procedure is repeated.

HOW MANY YEARS DOES A CORNEAL TRANSPLANT LAST?

Corneal transplantation has a high success rate, but your prognosis will depend on why you need the transplant. In some diseases, more than 90% of transplants function well after 10 years, but in more complicated cases, the donated tissue may only work for a few years. Your eye doctor can give you a more detailed explanation on what you can expect from your transplant.

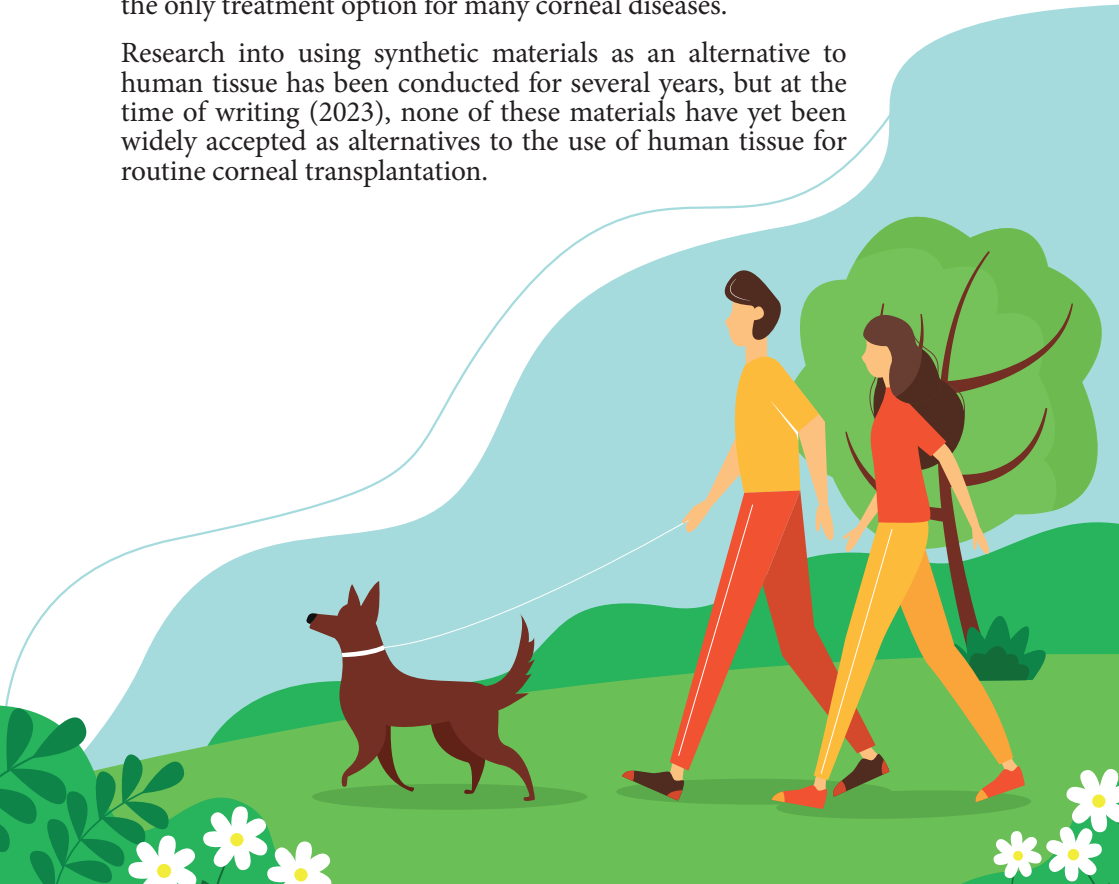
WHAT SHOULD I DO IF I AM WORRIED ABOUT RECEIVING A CORNEAL TRANSPLANT?

The aim of a corneal transplant is to improve your vision, decrease pain, make wearing glasses or contact lenses more comfortable, reduce glare and, most importantly, improve your quality of life. Nevertheless, if you have any concerns, you should discuss these with your doctor. If you don't understand what you are told or if you want to know more, don't hesitate to ask for more information.

FUTURE PERSPECTIVES AND ALTERNATIVES

Corneal transplantation with human donor tissue is currently the only treatment option for many corneal diseases.

Research into using synthetic materials as an alternative to human tissue has been conducted for several years, but at the time of writing (2023), none of these materials have yet been widely accepted as alternatives to the use of human tissue for routine corneal transplantation.



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