CHAPTER 8

SURGERY OF THE CONJUNCTIVA AND CORNEA

The conjunctiva lines the surface of the eye and the inside of the lids. It is a mucous membrane which protects the eye from infection and keeps its surface moist. It is vital for the health of the cornea. Under the mucosal surface of the conjunctiva there are numerous patches of lymphoid tissue, and a rich supply of blood vessels and lymphatics. The conjunctiva is closely related to the cornea both in structure and function. At the limbus the conjunctival epithelium becomes the corneal epithelium.

The Cornea

Corneal diseases are very common in hot climates, and in many cases will cause loss of vision from corneal scarring. Indeed blindness from corneal scarring is very common in developing countries but rare in developed ones. There are many reasons for this, some from the climate of the tropics and some from poor hygiene and nutrition:

- Excess solar and ultra violet radiation causes pterygium and solar keratopathy.
- In desert areas the sand and dust constantly irritate the eye and can cause foreign bodies which scar and ulcerate the cornea.
- Where the climate is hot and humid, bacteria and fungi can easily multiply and cause corneal abscesses.
- In rural communities there is a higher risk of scratching the cornea with a twig or thorn.
- Poor hygiene and overcrowding encourages the spread of eye to eye infections. Trachoma is the most common of these but other organisms like adenovirus, herpes simplex and bacterial conjunctivitis are spread in the same way.
- Measles often affects the cornea, where measles vaccination is not available.
- Malnutrition causes vitamin A deficiency which can cause devastating corneal ulcers in young children.
- Traditional eye medication may be given by untrained healers and some of these medications can be toxic to the cornea.

The conjunctiva is on the surface of the eye, and so there is no difficulty in surgical access. Anaesthesia is usually easy, topical anaesthetic drops will anaesthetise the

conjunctival surface and a sub conjunctival injection of local anaesthetic will provide additional anaesthesia. Dilute adrenaline should always be added because the conjunctiva is so vascular. The sub-conjunctival local anaesthetic injection also separates the conjunctiva from the underlying sclera and so makes surgery easier. Retrobulbar anaesthesia is rarely necessary.

There are several indications for conjunctival surgery. The most important are:

- A flap of conjunctiva can be used to cover diseased or damaged cornea.
- Excision of a pterygium or a conjunctival neoplasm.
- Reconstruction of damaged or scarred conjunctiva after disease or injury.

Conjunctival flaps to cover the cornea

The conjunctiva can provide a very useful protective covering for the cornea. Being vascular tissue, it brings cells such as fibroblasts and white cells into the cornea which help corneal ulcers and wounds to heal. It also provides a physical cover to the ulcer or wound. When the healing process is complete the conjunctiva will often spontaneously retract back to the limbus. If it does not, then the flap can easily be replaced. Naturally an opaque scar will be left in the damaged cornea but hopefully the eye will be saved from worse damage and will heal quicker.

The common indications for a conjunctival flap are:

- A long-standing and deep corneal ulcer which is not healing, particularly if the ulcer has perforated or is about to perforate. Sometimes a perforated ulcer can be sealed with tissue glue (see page 273).
- A penetrating corneal wound with iris prolapse which has presented too late for a primary repair (see page 303).
- Bullous keratopathy which is nearly always caused by damage to the corneal endothelium during cataract surgery (see page 171). The patient experiences recurrent and severe pain from the bullae or ulcers in the corneal epithelium. If the corneal epithelium is replaced with conjunctiva which has lymphatics and blood vessels, the ulceration ceases and the pain subsides. However the vision will not improve, for this a corneal graft is needed.

There are different ways of getting the conjunctiva to cover the cornea. The best is to advance a flap of conjunctiva from the limbus to cover the cornea. This is a versatile and simple operation by which the conjunctiva can be used to cover either a small peripheral lesion or the entire cornea. For peripheral lesions the conjunctiva can be advanced from the adjoining limbus (fig. 8.1). To cover the central cornea or the whole cornea, it is usual to advance the conjunctiva from the upper limbus because there is more conjunctiva to spare in the upper fornix (fig. 8.2 and 8.3). Also the conjunctiva here is protected by the upper lid.

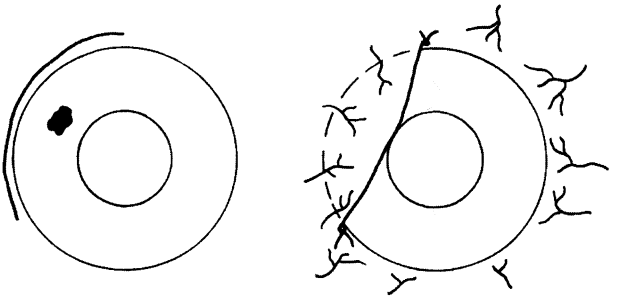


Fig. 8.1 A conjunctival flap to cover a peripheral corneal lesion

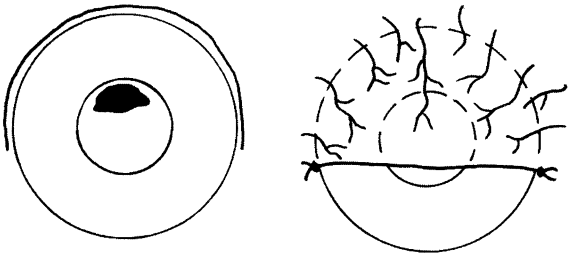


Fig. 8.2 A conjunctival flap to cover a central corneal lesion

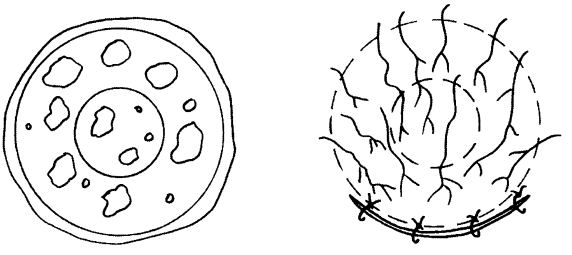


Fig. 8.3 A conjunctival flap covering the entire cornea

The three secrets to performing a successful conjunctival flap:

1. The conjunctiva must be *fully mobilised* and dissected from Tenon's capsule.
2. The epithelium of the cornea should be removed to help the conjunctiva to stick to the cornea
3. The flap must be *secured tightly*. It should be sutured so that it presses down tightly against the cornea and does not move around as the eye moves.

Surgical Technique for a Conjunctival flap

1. Insert a speculum, apply topical anaesthetic drops and inject into the subconjunctival tissues with local anaesthetic and adrenaline.
2. Plan the site and the size of the flap to cover the required part of the cornea.
3. Incise the conjunctiva at the limbus using non-toothed forceps and fine scissors (see fig. 5,11, page 96). To cover a peripheral corneal lesion this incision should be about one-third of the circumference of the limbus. To cover a central corneal lesion it will need to be about two-thirds of the circumference of the limbus, and to cover the entire cornea the incision should be the entire circumference of the cornea (see figs. 8.1 to 3).
4. The conjunctiva should now be dissected free from Tenon's capsule and the sclera, dissecting backwards from the limbus towards the fornix. (Tenon's capsule is the layer of fibrous tissue which joins the under-surface of the conjunctiva to the sclera, it is more obvious in young people and gets thinner with old age). This is done by inserting both blades of the scissors under the conjunctiva at the limbus, pulling on the edge of the conjunctiva with non-toothed forceps to make it taut, and opening and closing the scissors just under the conjunctival surface to cut through the deep attachments of the conjunctiva (fig. 8.4). For a conjunctival flap which is to cover the whole cornea the conjunctiva should be dissected back almost to the upper conjunctival fornix, about 15 mm from the limbus.

   If a big flap is being made there are two common problems which occur. The first is not separating the conjunctiva properly from the Tenon's capsule, and this is the most common mistake. The conjunctiva should lie over the lesion without tension at the end of the dissection. If the flap is planned to cover the whole cornea, then the flap should cover the whole cornea without retracting upwards by itself. ***It should rest over the lesion without being under***

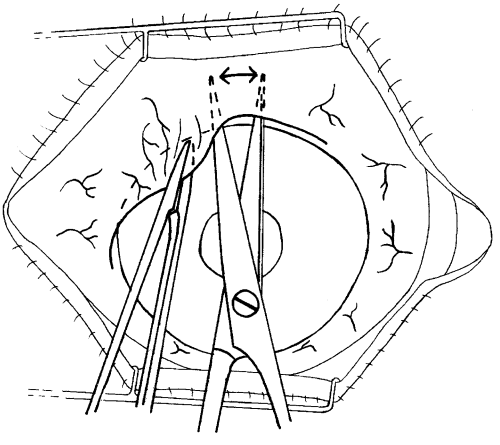


Fig. 8.4 Dissecting the conjunctival flap to separate it from Tenon's capsule and the eyeball

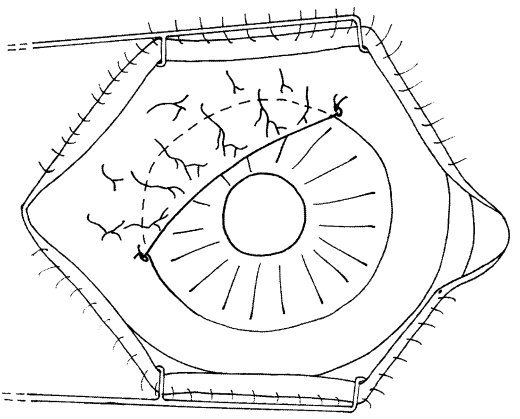


Fig. 8.5 The edges of the flap are sutured tightly to the limbus

tension and it should not retract spontaneously. If this happens further dissection is necessary, by continuing to separate the many attachments of Tenon's capsule from the under surface of the conjunctiva.

The second is accidentally making a small "button-hole" in the conjunctiva. If that happens it doesn't matter too much, but if the button-hole is rather large it may have to be closed with sutures.

5. The corneal epithelium should be scraped off from the area to be covered by the flap. This helps the conjunctiva to stick to the cornea. It is best done by using a flat scalpel blade as a scraper, and it may be helpful to gently scrape any mucus or plaque from a chronic corneal ulcer as well. For bullous keratopathy the entire corneal epithelium must be scraped away, but it usually peels off quite easily.

6. Fixation of the conjunctival flap. This is done by suturing the edge of the flap tightly and firmly to the limbus. For a flap covering part of the cornea this is achieved with 2 sutures placed where the edge of the flap crosses the limbus. The sutures should take a deep secure bite of limbal tissue to anchor the flap firmly, and so that it presses tightly against the corneal surface. The suture material should be as fine as possible (preferably 8"0" virgin silk or polyglactin) (fig. 8.5). If 10"0" monofilament suture is used, it is best to start and finish with suture inside the tissues so that the knot is buried.

   For flaps that cover the whole cornea, the conjunctiva is pulled down from above and anchored to the lower limbus with several sutures. An incision at the lower limbus helps the edge of the flap to stick down to the lower limbus, and again deep bites should be taken to anchor the sutures (fig. 8.3).

Post-operative care

A subconjunctival antibiotic injection should be given at the end of the operation if it was performed for a chronic corneal ulcer or a corneal injury. Antibiotic drops or ointment should be applied and the eye padded for 24 hours. At first the

conjunctival flap looks very vascular and opaque but with time it will become thinner and more transparent. The healing process is usually complete after about 2 months. If the flap has not retracted back to the limbus spontaneously it can easily be dissected free.

Pterygium

A pterygium (literally a wing) is an opaque wedge of conjunctival epithelium and blood vessels, which grows across the cornea from either the medial or lateral limbus, but more often the medial. A pterygium behaves like a piece of conjunctival scar tissue. It develops in response to excess exposure from ultra-violet light, and so it occurs mostly in the tropics.

It is extremely common to have a small pterygium at the limbus, and this may often grow into the peripheral cornea. Fortunately the pterygium only rarely grows beyond the pupil margin where it may begin to affect the sight. In young patients the pterygium looks quite thick and "fleshy" with numerous blood vessels, but in older patients the pterygium often becomes thinner and more transparent with less blood vessels. It is quite easy to remove a pterygium, but unfortunately it nearly always grows again. There seem to be two reasons for such a high incidence of recurrence following excision.

1. The pterygium is scar tissue which contains *fibroblasts*, so excising it only stimulates these fibroblasts, especially in young people whose fibroblasts are more active. Indeed the pterygium which regrows following excision is often bigger and more vascular than before. The fibroblasts are less active in elderly patients and so the risk of recurrence is less. The appearance of the pterygium also gives some indication as to the risk of recurrence. If the pterygium is thick, fleshy and opaque, it is much more likely to recur; if it is thin and transparent it is less likely to recur.

2. The *limbal stem cells* are special cells at the limbus which make the epithelium of the cornea develop normally. These stem cells are probably damaged after prolonged exposure to sunlight, so the conjunctiva grows across the limbus instead of corneal epithelial cells.

   Simply excising the pterygium doesn't alter either of these two basic pathological reasons which made the pterygium grow in the first place. Therefore surgical excision of a pterygium is not advised unless it has reached beyond the pupil margin. Even if surgery is necessary, patients should be warned of the serious risk of recurrence, especially if they are young, or have a thick fleshy pterygium.

Preventing recurrence of pterygium after excision

There are two ways of trying to lessen this high risk of recurrence, either by suppressing the activity of the fibroblasts, or by transplanting some limbal stem cells to suppress the growth of new blood vessels and the activity of the fibroblasts.

The activity of the fibroblasts can be suppressed in different ways.

- *Topical steroid drops*. These will suppress fibroblast activity, and so should be given postoperatively fairly frequently (six times a day) for about 4 to 6 weeks until the wound is fully healed.

- *Mitomycin C.* This is a much more powerful drug which will completely inhibit the activity of all the fibroblasts. It prevents natural wound healing as well as the recurrence of the pterygium, and must therefore be used with great caution. Mitomycin drops are available commercially but may be hard to locate, or they may be made up in a hospital pharmacy. The recommended strength is a 0.02% solution in normal saline (0.2 mg per ml). It is an extremely effective and powerful drug, but can cause side effects, especially failure of the wound to heal and atrophy of the sclera. Also the precise dose and the best way of giving the treatment have not yet been completely worked out. It is usually given during the operation by applying a small sponge soaked in mitomycin solution to the wound for 3 to 5 minutes. After applying the mitomycin the wound should be copiously irrigated with saline to wash away any excess and prevent complications. Mitomycin has also been given as postoperative drops 4 times daily for 5 days. It is probably safer to give it just once during the operation because of it being such a powerful drug and the risks of it not being used properly postoperatively by the patient.
- *Thiotepa.* This is similar to mitomycin but a little weaker in its action. Thiotepa drops are recommended as a 0.05% solution in normal saline (0.5 mg per ml). They should be applied postoperatively 4 times daily for 4 to 6 weeks. The drops will probably have to be made up in a hospital pharmacy.
- *Beta radiation.* These are electrons which have only very superficial penetration. As they are absorbed by the tissues they inactivate cells which tend to divide, whilst not damaging resting cells. The usual source of beta radiation is a strontium 90 applicator. This must be kept in a radiation proof container and applied to the limbus over the base of the pterygium. The recommended maximum dose is 2000 rad (20 Grey), but 1500 rad (15 Grey) is probably sufficient. It can be given in one application immediately post operatively. This dose should not be exceeded because of the risk of causing delayed radiation damage to the eye, and in particular lens opacities.

Delayed wound healing and necrosis of the sclera. Mitomycin C, thiotepa and beta radiation can all cause delayed wound healing and necrosis of the sclera. However if used in the correct manner and the correct dose this is not common. It is equally important to avoid excessive cautery or diathermy to bleeding points as this will also cause necrosis of the sclera.

Transplanting limbal stem cells.

The technique for this is described below. The best method is to take a free graft of healthy conjunctiva and limbal tissue from the upper and outer quadrant of the same eye. There are other ways of covering with conjunctiva the bare area left after excising the pterygium. These are slightly easier to do but less effective.

These are useful techniques to help prevent recurrence but they have two disadvantages:

- They take quite a lot of time especially the free graft of conjunctiva.
- The sutures that must be used to secure the graft or cover the defect will act as foreign bodies, and provoke the fibrosis which the operation is trying to prevent.

Conclusions

- All cases must be given some treatment to try to prevent recurrence.
- Topical steroids are always available and have few side effects when used for only six weeks. They should be given to every patient as a full postoperative course.
- Young patients, patients who have had previous surgery for a pterygium, or patients with a thick fleshy pterygium have a very high risk of recurrence after surgery (about 70 to 80%). Topical steroids alone will not be enough to prevent recurrence. These should receive either a limbal stem cell graft or mitomycin, thiotepa or beta radiation according to availability.
- Try to cause as little surgical trauma as possible. The less traumatic the excision, the less likely it is to provoke postoperative inflammation and a recurrence. Excessive surgical trauma and excessive use of the cautery will also risk causing delayed wound healing and scleral necrosis especially if mitomycin or beta radiation is used.

Technique for excision of pterygium

1. Apply topical anaesthetic drops and inject local anaesthetic with adrenaline into the body of the pterygium.
2. Grasp the pterygium near its tip with fine toothed forceps and with a razor blade fragment or scalpel shave off the tip of the pterygium from the cornea (fig. 8.6).
3. Continue to cut the pterygium from the surface of the cornea, keeping the plane of dissection as superficial as possible, preferably just under the epithelium and not into the corneal stroma. Once the dissection has reached the limbus, the base of the pterygium can easily be separated from the sclera. With scissors divide the pterygium across its base to leave a small bare area of sclera about 3 mm from the limbus (fig. 8.7).

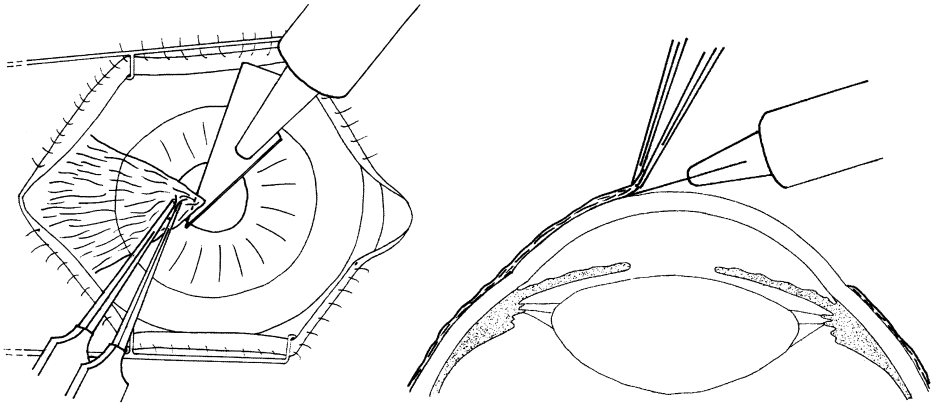
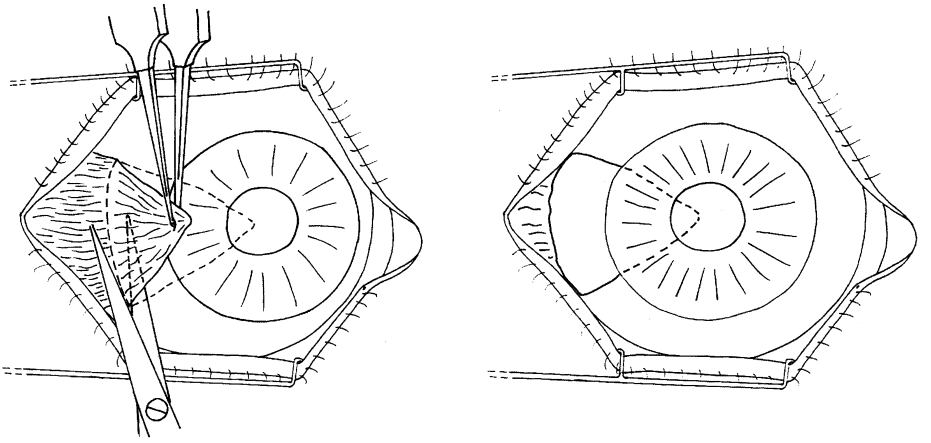


Fig. 8.6 Starting to dissect a pterygium off the cornea



8.7 Excising the base of the pterygium to leave a bare area of sclera

Apply gentle cautery or diathermy to seal any conjunctival or sub conjunctival bleeding points at the base of the pterygium. Take great care that this is just enough to seal the vessels and does not damage the sclera, or cause necrosis of the tissues. Some of the reports of scleral necrosis after mitomycin and beta radiation may be partly due to excess cautery, diathermy or surgery and not to the actual treatment.

4. Some surgeons find it easier to dissect the pterygium off the eye from the opposite direction. In this method scissors are used to divide the base of the pterygium so that it is only adherent to the cornea. It can then be peeled off the cornea by grasping its base and dissecting it free with a scalpel blade. Whichever method is used it is important to preserve all the superficial layers of the sclera and cornea and only remove the pterygium.
5. If mitomycin is being used it should now be applied for 3 to 5 minutes and then the wound and the conjunctival sac copiously irrigated with saline.
6. Wound closure. With the bare sclera technique no further surgery is done, and the sclera is left bare. The sclera may be covered by a free autograft of the conjunctiva or by mobilising the surrounding conjunctiva.

Free autograft of the conjunctiva

(An autograft means grafting some tissue from the patient's own body.) There have recently been encouraging reports about the use of a free graft of conjunctiva to prevent pterygium recurrence as an alternative to cytotoxic drops or beta radiation. A piece of bulbar conjunctiva from the upper outer quadrant of the eye is excised and used to cover the bare area of sclera left by the removal of the pterygium (see fig. 8.8). The technique is a little time consuming but quite straightforward. Local anaesthetic with adrenaline is injected under the donor conjunctiva which is carefully dissected off the underlying Tenon's capsule right up to the limbus. It may help to use a knife to shave off a very small layer of the peripheral cornea as well as the conjunctiva. This gives the graft some stability so it doesn't wrinkle up and become very hard to handle. It also ensures that the vital

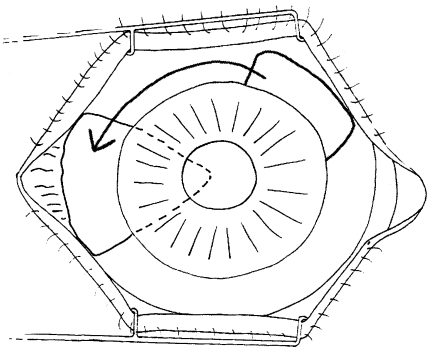


Fig. 8.8 To show the site of the conjunctival transplant

limbal stem cells are included in the graft. The donor site is left bare and soon becomes spontaneously covered with conjunctiva. The conjunctival graft is carefully sutured into the bare area using fine interrupted sutures. If possible the sutures at the corneal side should be 10"0" nylon with buried knots so as not to cause any postoperative inflammation. Take great care to maintain the correct orientation of the graft so that the limbal conjunctiva is attached to the limbus, and equally important that the graft is not turned upside down. It may help to get the right orientation by inserting one or two sutures in the graft before completely separating it from its bed.

Other methods of covering the bare area of sclera

Sometimes there may be some scarring over the donor site so that a conjunctival autograft cannot be done. There are also simpler ways of covering the bare area of sclera after excising the pterygium, if operating time is limited.

- The conjunctiva may be mobilised by incisions at the limbus so as to cover the defect. This is the easiest method. (fig. 8.9) Some surgeons routinely do this if mitomycin has been applied to lessen the risk of poor wound healing.

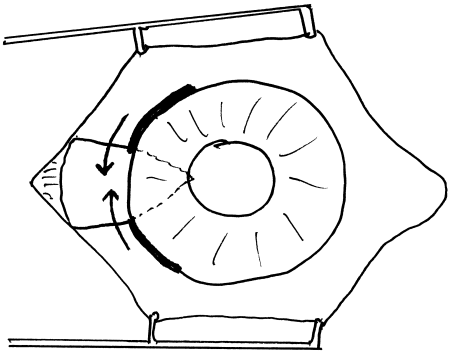


Fig. 8.9 Advancing the adjoining conjunctiva to cover the bare area

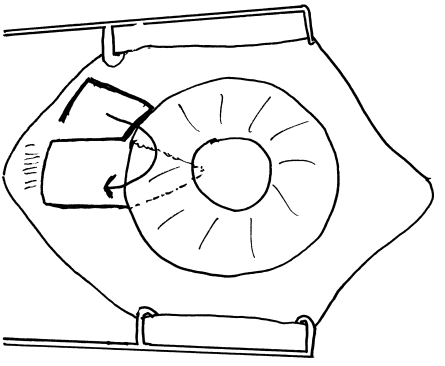


Fig. 8.10 Rotating a flap of adjoining conjunctiva to cover the bare area

- A flap of conjunctiva from above the wound may be rotated down into the defect. (fig. 8.10)
- Which ever method is used, the risk of recurrence is less if the suture knots are buried or the sutures are very carefully trimmed so as not to act as foreign bodies.

Post operative care

The postoperative care has already been discussed. It may be helpful to pad the eye for a day especially if a conjunctival graft has been performed.

Excision of conjunctival tumours

These are found mostly at the limbus but they may occur elsewhere. In most cases they can be cured by local excision, and removing a small margin of healthy conjunctiva as well. Limbal lesions should be removed with a small margin of superficial corneal tissue, dissecting in the same manner as for a pterygium. Usually it is fairly easy to shave these lesions off the marginal cornea using a scalpel blade or razor blade fragment. In some areas conjunctival tumours have become quite common in patients who are HIV positive.

With extensive lesions it may be necessary to excise eyelid tissue as well, or even to exenterate the whole orbit. A biopsy should be taken to confirm the diagnosis before planning any extensive surgery. Extensive surgery is not indicated if the tumour has spread to the regional lymph nodes or elsewhere.

Conjunctival reconstruction

The conjunctiva may be scarred or there may be adhesions between the eyelids and the eye (symblepharon) after severe conjunctival inflammation or burns. If possible an attempt should be made to reconstruct the conjunctiva using a flap graft of conjunctiva from the same eye.

It is possible to use a free conjunctival graft from the other eye, but the surgeon should be very hesitant about using tissue from the only good eye to repair the damaged one. A mucous membrane graft from the mouth can also be used to reconstruct the conjunctiva but it is not entirely satisfactory. The best place to remove the mucous membrane is from the bottom of the lower lip near the gum. For an eye which has been severely burnt with gross corneal scarring, a small graft of limbal tissue from the unaffected eye may greatly improve the scarring by bringing healthy limbal stem cells into the damaged eye. The technique is the same as described for a pterygium.

Removal of a sub-conjunctival loa-loa worm

This is an occasional problem in West and Central Africa. The worm moves actively under the conjunctiva and causes considerable irritation although there is no risk to sight. If it dies and disintegrates there will be a marked inflammatory reaction in the orbit and eyelids. Therefore the worm should be removed if possible.

Method:

1. Anaesthetise the conjunctiva with several applications of topical local anaesthetic drops and apply a speculum.
2. Grasp the body of the worm through the conjunctiva with non-toothed forceps and do not let go.
3. Cut a small hole in the conjunctiva with scissors alongside the worm and continue the dissection until the edge of the worm is exposed. At this stage some local anaesthetic can be injected subconjunctivally if the patient is feeling pain or if the worm is very active.
4. Using either a probe, a muscle hook or forceps, lever the worm out through the hole in the conjunctiva. Then grasp it and let go with the forceps which were holding it through through the conjunctiva.
5. Carefully pull the entire worm out of the tissues.

Surgery for Corneal Scars

Corneal scarring is very common in hot countries for the reasons already given. Surgical treatment can benefit many patients with corneal scars, and there are four possible treatment options, corneal grafting, corneal rotation, optical iridectomy and superficial keratectomy. Before even thinking about operating, the surgeon must make a good clinical assessment of the case and the patient's background.

- Is the scar permanent and inactive or is there still some inflammation in the cornea? If the cornea is still inflamed, medical treatment especially with topical steroids may help to clear the cornea.
- Does the other eye have good vision? If the other eye is healthy there is little to be gained from surgery.
- At what age did the scar develop? If the patient was young, the eye is likely to be amblyopic especially if the other eye is normal. Poor fixation, nystagmus and a squint are all signs that the eye is amblyopic.
- Has a careful refraction been done? Many eyes with corneal scarring have bad astigmatism which can be helped with glasses.

Corneal grafting

A corneal graft operation removes the central part of the cornea which is diseased and scarred, and a healthy cornea is used to replace it (see fig. 8.11). Nearly always the donor cornea comes from a person who has died. The surgery is very delicate and fine, although not particularly difficult. However the body tends to reject tissue from another person, so the patient needs to be followed up very carefully for a long time postoperatively to prevent graft rejection. There are many visually handicapped people in the world whose sight could be restored with a corneal graft (probably several million). Unfortunately there are many reasons why corneal grafting is not in practice going to be of much help to them.

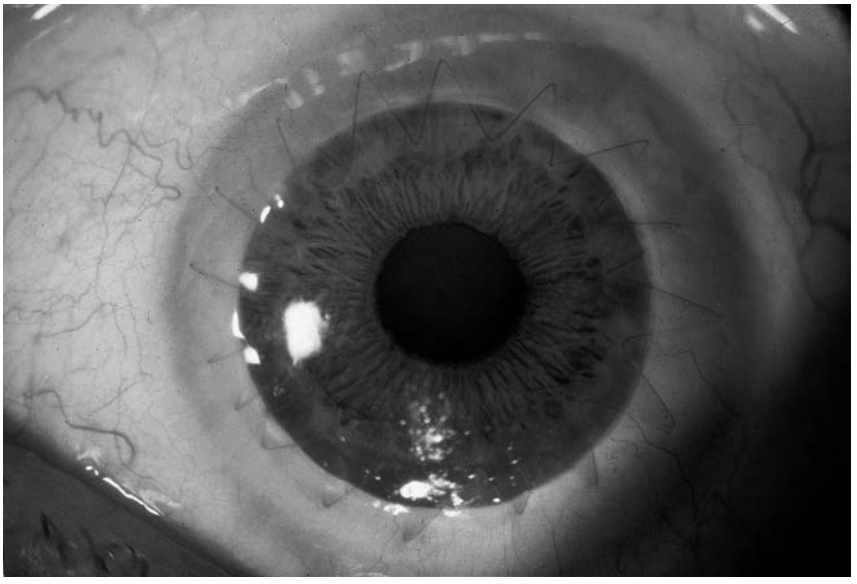


Fig. 8.11 A successful corneal graft

- The patients who have the most dense and opaque corneal scars are the same ones who are most likely to reject the graft. If the scar is very dense it is likely to be vascularised, and it is the blood vessels which provoke the rejection.
- Corneal graft donor material is very scarce, especially in those places where corneal scarring is common.
- Good reliable donor material is very expensive, and most patients with corneal scarring are poor. Trying to prevent corneal scarring is much more cost effective than trying to treat it.
- Lengthy follow up postoperatively is essential.
- The conjunctiva and eyelids must be healthy for a corneal graft to succeed.

There are two types of corneal grafts; full thickness or penetrating grafts in which the full depth of the cornea is replaced, and lamellar grafts in which only the stroma and anterior part is replaced but the patient's own endothelium is preserved. Because of the complexity of corneal grafting it will not be described in any more detail.

Optical iridectomy

If there is a large central corneal scar, and a small piece of peripheral cornea is clear and transparent, it is possible by removing some of the iris to create an artificial pupil in line with the clear portion of the cornea (fig. 8.12). This is called an optical iridectomy. Ideally these patients should have a corneal graft operation but this is nearly always impossible. An optical iridectomy is a quicker and usually an easier operation. It requires very much less postoperative care, and the patients can be discharged after a few days. As described above there is little point in operating if the other eye is normal or if there is poor fixation.

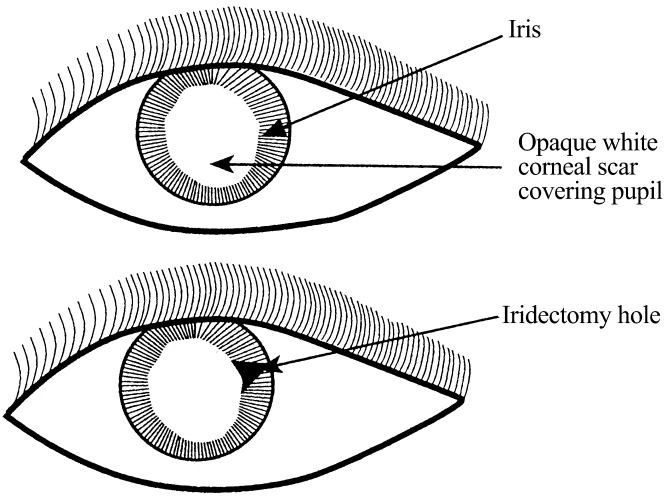


Fig. 8.12 Optical iridectomy. The small hole in the iris enables the patient to see through the clear cornea and around the central corneal scar, which is opaque.

The operative technique is basically the same as for a peripheral iridectomy (see page 190). However the hole in the iris is in a slightly different place. A peripheral iridectomy aims to place the hole in the periphery of the iris, but an optical iridectomy aims to make a much more central hole, and nearly always to divide the pupil margin. These eyes are often difficult to operate on because they have suffered a severe inflammatory disease. Besides the corneal scar, the iris is often adherent to the lens (posterior synechiae) and to the cornea (anterior synechiae). In severe cases the lens may also be damaged. So at every stage there may be difficulties:

- Place the incision to correspond with the clear gap in the cornea. Only a small iridectomy in the right place is necessary.
- It may be difficult to dissect a conjunctival flap because of scarring and adhesions between the conjunctiva and the sclera.
- The limbus may be very vascular because of previous inflammation in the eye.
- For an optical iridectomy the incision should enter the eye near the limbus but the aim is to grasp the iris with the iris forceps fairly near the pupil margin (fig. 8.13a). The iris may not prolapse by itself from the eye because of adhesions to the cornea or the lens.
- Try to grasp the iris and pull it out through the wound, but great care must then be taken not to cause bleeding inside the eye.This usually comes from pulling too hard on the iris which is stuck down in the eye, and so detaching the base or root of the iris from the ciliary body and rupturing the main artery of the iris. Bleeding may come from adhesions between the iris and the lens or cornea.

Optical Iridectomy

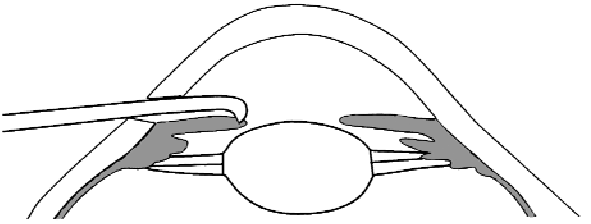


Fig. 8.13a Grasping the iris near the pupil margin

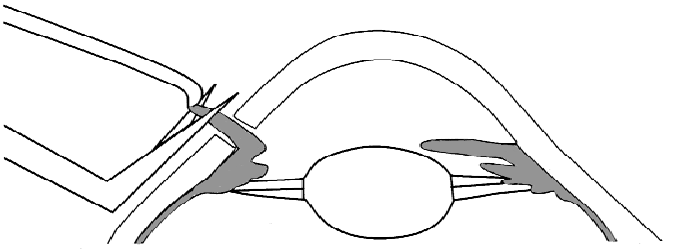


Fig. 8.13b Excising the iris with De Wecker's scissors

- Take care not to damage the lens capsule which will cause a cataract to develop.
- Once the iris is out of the eye, use iris scissors to perform the iridectomy. (fig. 8.13b)
- Plan to place the iridectomy hole in line with the clear cornea. Nearly always the sphincter of the pupil should be divided.
- In some cases it may be better to use intraocular scissors to cut a hole in the iris inside the eye, rather than try to prolapse a stuck down iris out of the eye. Again take great care not to damage the lens capsule.
- Having done the iridectomy, the surgeon may discover a cataract or a dense fibrous membrane which is the remains of a cataract behind the iris. It may be necessary to convert the operation to a cataract extraction, or to use intraocular scissors or a needling knife to make a hole in a dense fibrous membrane or thickened lens capsule lying behind the iris.
- If there has been intraocular bleeding, try to wait a few minutes for this to stop before closing the wound. It doesn't matter too much if a small blood clot is left in the eye, but it does matter if there is still active bleeding into the eye at the end of the operation.
- The wound may need one or two fine sutures for secure closure.

Postoperative care.

This is the same as for other intraocular surgery: topical antibiotics, steroids and mydriatics. A subconjunctival injection at the end of the operation may be helpful. The patients can be discharged after a few days.

Remember that all optical iridectomy patients need a careful refraction post-operatively. They often have severe astigmatism.

Corneal Rotation

This is a possible alternative to an optical iridectomy. An optical iridectomy creates an artificial pupil to be in line with the clear cornea. A corneal rotation moves the cornea round so that the clear part comes into the centre to be in line with the normal pupil (fig. 8.14). This is a type of corneal graft, but it does not require a donor cornea because the patient's own cornea is being used, and there is no possibility of the cornea being rejected. It therefore avoids the two most important problems of corneal grafting. *However the operation should only be attempted by someone who has some experience of corneal grafting.*

The steps of the operation are in outline as follows:

1. The anterior chamber is filled with visco-elastic fluid or air to protect the iris or lens, and a trephine of 8 or 8.5 mm is cut eccentrically to include the clear cornea and the scar at the centre. A sharp knife or scissors may be needed to complete the trephine.
2. If there is also a cataract, it may be removed at this stage and an intraocular lens inserted.
3. The cornea is then replaced with the clear cornea in the centre of the eye, and carefully sutured with interrupted monofilament 10 "0" sutures with the knots buried.

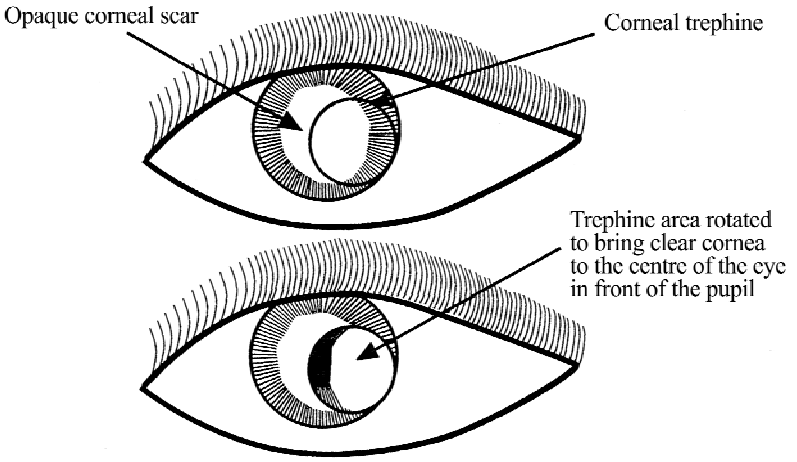


Fig. 8.14 Corneal rotation. The cornea is trephined eccentrically and then rotated so that the clear cornea comes to the centre of the eye and the scarred cornea goes to the periphery. If needed, a cataract extraction and intraocular lens implant can be performed at the same time.

Postoperatively topical steroids and antibiotics should be given for a few weeks and mydriatics for a few days. By carefully removing one or two of the sutures after about 8 weeks, post operative astigmatism which is very common can be much reduced.

For an experienced surgeon this is a slightly better operation than an optical iridectomy, because the post operative astigmatism can be better controlled. It also enables a cataract extraction and IOL implant to be done as well which is not possible with an optical iridectomy. However it is a more difficult operation than an iridectomy, and there are more risks of surgical mistakes occurring.

Superficial Keratectomy

Sometimes the corneal opacity is located only in the very superficial layers of the cornea and merely by shaving off the anterior layers of the cornea the vision will improve. There are two distinct conditions in which this may happen.

Solar keratopathy affects people who are exposed to very high levels of sunlight such as desert dwellers, and fishermen who receive direct sunlight and also reflected sunlight from the sea surface. They develop degenerative changes in the anterior layers of the exposed central and lower parts of the cornea. As well as the opacity, the surface of the cornea becomes very irregular. After applying topical anaesthetic drops a sharp knife blade is used to excise the opaque and irregular surface layers of the cornea. The corneal epithelium regenerates very quickly in a day or two and there may be significant improvement in the vision.

Sub-epithelial band calcification of the cornea may occur but the cause is uncertain. A thin layer of opaque calcium salts is deposited just under the corneal epithelium and will affect the vision. The treatment is to apply topical anaesthetic drops, to scrape away the corneal epithelium, and then try to scrape off the calcified layer using the flat side of a scalpel. Irrigation of the cornea with a chelating agent which dissolves calcium helps this deposit to dissolve much more quickly and easily. Sodium versenate or EDTA is the usual agent. The epithelium grows again very quickly.

Tissue Glues to seal Perforated Corneal Ulcers

As an alternative to a conjunctival flap operation, it is possible to use tissue glue and a soft bandage contact lens to seal perforated corneal ulcers. This treatment is only recommended if the ulcer is not heavily infected with bacteria, and if bandage contact lenses are available.

The glue used is cyanoacrylic "superglue" which hardens instantly on contact with tissues or fluid. After applying local anaesthetic drops, the perforation and the area around it must be thoroughly and firmly scraped and dried to remove debris, mucus and fluid, so that the glue can stick to the tissues. A scalpel blade and a small dry swab are used for this. A very tiny amount of glue is then applied on to the ulcer, and immediately a soft bandage contact lens placed over the entire cornea.

Routine topical and systemic treatment for the ulcer should then be given, and the eye left without a pad if possible. After about 10 days the contact lens can be removed. The plug of glue will usually come off as well and the perforation should have healed.