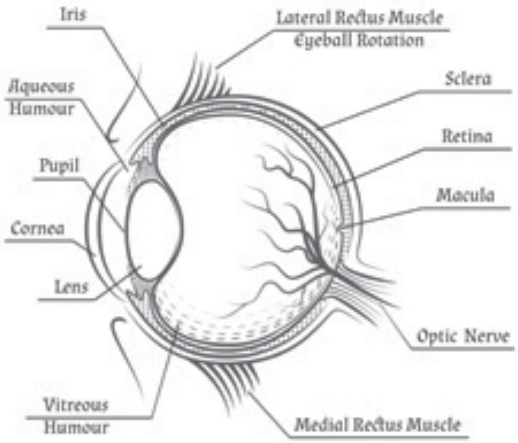
INDEPENDENT DIABETES TRUST

PO Box 294 Northampton NN1 4XS Telephone: 01604 622837

The Eye and Diabetes

Contents

Information Leaflet
Updated March 2026



Anatomy of the eye

Before considering diabetic eye disease we need to understand a little of the anatomy of the eye and how the eye works.

- **IRIS** - this regulates the amount of light that enters the eye. It is the coloured part of the eye across the front of the lens. Light enters through a central opening called the pupil.
- **PUPIL** – is the circular opening in the centre of the iris through which light passes. The iris controls dilation and constriction of the pupil.
- **CORNEA** - is the clear circular part of the front of the eyeball. It refracts the light entering the eye on to the lens, which then focuses it on to the retina. The cornea is extremely sensitive to pain.
- **LENS** - is a transparent crystalline structure behind the pupil of the eye. It helps to refract incoming light and focus it on to the retina. A cataract is when the lens becomes cloudy, and then the lens can be removed and replaced with a plastic intra-ocular lens.
- **VITREOUS** – is a clear jelly-like material in the middle of the eye.
- **RETINA** - is a light sensitive layer that lines the interior of the eye. It is made up of light sensitive cells known as rods and cones. The rods are necessary for seeing in dim light and the cones best in bright light and are essential for receiving a sharp accurate image. Cones can also distinguish colours. The retina works much in the same way as film in a camera.

- **MACULA** - Is the yellow spot on the retina at the back of the eye and is the area with the greatest concentration of cone cells. It is the area of greatest acuity of vision such as reading.
- **OPTIC DISK** - is the visible portion of the optic nerve on the retina. The optic disk is the start of the optic nerve where messages from cone and rod cells leave the eye and pass along nerve fibres and so transfer all the visual information to the brain. The optic disk is also known as the 'blind spot'.

How we see

For sight to take place light must be able to pass to the retina at the back of the eye. The light passes through cornea and enters the eye through the pupil. It then passes through the lens and the vitreous to be focussed on the retina. The focussed light or images of what we have been looking at, are then passed down the optic nerve to the brain.

Retinopathy

Facts

- If diagnosed early enough diabetic retinopathy is a treatable condition.
- The usual treatment for diabetic retinopathy is laser treatment but there are recently developed drugs available under particular circumstances.
- Laser treatment has been shown to be helpful in either stopping the progress of the condition or in maintaining sight.

The National Service Framework for Diabetes states that everyone with diabetes should be offered screening for retinopathy once a year. More information can be found at www.diabeticeye.screening.nhs.uk

- There are two vulnerable groups of people susceptible to retinopathy – pregnant women, children and adolescents. In the long term children and adolescents are at greater risk of microvascular and macrovascular complications of diabetes.
- In children with Type 1 diabetes, it is recommended that surveillance for the earliest evidence of microvascular disease [this includes retinopathy] should begin at the age of 12.

What is diabetic retinopathy?

Retinopathy is usually classified according to its severity. This may not be the same in both eyes. There are two classifications of diabetic retinopathy:

Background retinopathy

This is the first stage of the development of retinopathy and it is rare before 8 to 10 years of diabetes duration. At this stage the vision is normal and sight is not threatened. If there are diabetic changes present such as small haemorrhages, fatty deposits [exudates] or abnormal blood vessels [microaneurysms] then this is a sign that the retinopathy is worsening and the doctor will be alerted to arrange more frequent follow ups.

Proliferative retinopathy

This is where the blood vessels [capillaries] block and starve the retina of nutrients causing new vessels to grow. These new vessels grow either in front of the retina on to the back of the vitreous or occasionally on to the iris. These new vessels are fragile and may bleed into the vitreous. This then affects the sight and may cause floaters, dots or lines and if severe may cause clouding of the vision or loss of vision.

If the vessels grow on the iris, they can cause a rise in pressure in the eye and severe, painful glaucoma. The new vessels eventually cause scar tissue and this can lead to a retinal detachment where the retina becomes detached from the back of the eye with a resulting severe loss of sight.

Points to remember:

- **If diagnosed early enough diabetic retinopathy is a treatable condition**
- **Regular eye checks do not prevent retinopathy but do enable early diagnosis and early treatment which will benefit your sight.**
- **Small blood vessels in the retina become blocked, swollen or leaky causing oedema and new, fragile vessels grow haphazardly in the retina. This process can continue for years without causing visual symptoms or visual impairment: during this period, retinopathy can only be detected by eye examination.**
- **In both Type 1 and Type 2 diabetes annual eye screening should be carried out.**

Who may develop diabetic retinopathy?

- Retinopathy can affect people with all types of diabetes:
- People who are treated with insulin both young and old.
- People who are treated with tablets.
- People on diet only.
- People who have well-controlled diabetes can develop retinopathy, especially if they have had diabetes for a long time.

Can retinopathy be prevented?

The best way to try to prevent it occurring is to try to keep blood glucose levels as near normal as possible. Early 'good' diabetic control may slow down the rate of progression of the condition. Improving diabetic control may not affect diabetic retinopathy itself, but it can prevent further deterioration. Therefore you should:

- Always take your diabetic medication - not doing so is harmful.
- Control your diet.
- Avoid becoming overweight.
- Avoid smoking and alcohol.
- Have regular blood pressure checks.

Retinopathy and driving

You should tell the DVLA and your motor insurers, if you have retinopathy that requires treatment or if you have had treatment for retinopathy in the past. It is a condition that should be declared under the item 'has there been any material change that could affect your driving.' For instance, if you are involved in a road traffic accident and you have not declared your retinopathy, then you may not be insured and the DVLA could take legal action because you have not informed them.

Glaucoma

Facts

- Glaucoma is a leading cause of blindness and it is estimated to be responsible for 13% of those on the UK blind register.
- Glaucoma rarely affects people under the age of forty.
- In the UK it affects 2% of people over forty.
- Blindness is preventable if glaucoma is diagnosed and treated early enough.
- Glaucoma is not catching and is not caused by diet, work or any other factors.
- Glaucoma can be controlled with treatment but not cured.
- Glaucoma cannot be prevented but having regular eye checks will enable early diagnosis and treatment, particularly in people over 40. In the UK sight tests are free for people with diabetes and for people with glaucoma and their close relatives – parents, offspring and siblings of the person affected.

What is glaucoma?

Glaucoma is a condition where there is loss of vision due to damage to the optic nerve that carries the images from the retina to the brain. Usually glaucoma is accompanied by an increased pressure in the eye, but not always. This pressure is called the intra-ocular pressure or IOP and this pressure damages the optic nerve. There are different types of glaucoma:

Chronic open angle glaucoma – this is most common form of glaucoma. It produces no symptoms - no pain or redness of the eye and the eyesight seems unchanged. It usually affects both eyes and develops slowly so that the loss of sight is gradual.

The whole of the contents of the eyeball are nourished by a fluid, called the aqueous humour. This fluid circulates within the eyeball and leaves the eye by small drainage tubes at the front. If there is an obstruction within this system, then the fluid cannot escape and pressure builds up within the eye. It is this persistent increased pressure that may damage the optic nerve and cause vision loss.

Acute angle glaucoma – is where there is a sudden increase in the pressure [IOP] in one eye. The eye becomes red and painful often accompanied by misty vision and seeing haloes around lights.

Secondary glaucoma – this is a group of conditions where the IOP is raised due to other diseases of the eye.

Congenital glaucoma – is where glaucoma is present at birth.

Note: eye pressure is not the same as blood pressure and the aqueous is not the same as tears.

The following information applies to chronic open angle glaucoma only.

Who may develop glaucoma?

- People of Afro-Caribbean origin are between 5 and 8 times more likely to have glaucoma and it may come on earlier and be more severe.
- People with a family history of glaucoma are more at risk with a 6 times greater risk if a near relative has it.
- People who are very short sighted [myopic] are more at risk.

Note: It has been thought that people with diabetes are more susceptible to glaucoma but the higher incidence of glaucoma may be due to a greater detection rate because people with diabetes have more frequent regular eye checks than the general population.

Tests for glaucoma

At a high street optometrist/optician

There are 3 tests that should be done but not all optometrists do all three tests, so check when you make your appointment. The 3 tests are:

1. To look at the back of the eye and the optic nerve with a bright light [ophthalmoscope]
2. Measurement of the pressure [often called the puffer test]. A raised pressure at this stage does not necessarily mean you have glaucoma.
3. Field of vision test where you are asked to look at a screen with a series of spots of light and you will be asked which ones you can see.

If there are any abnormalities then the optometrist will refer you to the hospital.

At the hospital

The following tests will take place at your hospital visit:

Measurement of the intra-ocular pressure - the eye is numbed by a drop of anaesthetic and the eye observed through an instrument called a slit lamp. The cornea [the front of the eye] is lightly touched with an instrument that measures the pressure.

One or more of the following tests will also be carried out:

Gonioscopy – this allows the doctor to observe the angle between the iris and the cornea.

Visual field measurement – you sit at a screen with your gaze fixed on a central light. Other lights flash on and off and you press a button when you see them. This test detects any blind areas of your visual field indicating where the nerve damage has occurred.

Optic nerve assessment – drops are put in the eye to dilate the pupil so that the doctor can examine the back of the eye more fully to record the health of the optic nerve by the appearance of the optic disk. Retinal photographs may also be taken so that these can be kept in your records to establish any changes in the future.

Note: you should NEVER drive yourself to the hospital because the drops used to dilate your pupils leave the vision blurry for a few hours.

Treatment

Eyedrops

The aim of treatment is to lower the intra-ocular pressure and prevent further vision loss. Most people with glaucoma require life-long treatment, usually with eye drops.

It can be quite difficult to put in eye drops so that they don't run down the cheeks but there is an inexpensive product on the market to help, called **Autodrop**. This is attached to the eye drop bottle to ensure that the bottle is held over the eye at the correct angle so that the dose is delivered in the right place. They are available from Owen Mumford's Medical Shop, to order contact: 01993 812021 or order online at www.owenmumford.com

Surgery

In some cases the intra-ocular pressure can be reduced by opening up the draining channels with laser treatment or by surgery to make a small drainage hole at the top of the eyeball. In these cases the need for ongoing treatment may be removed but not all cases are suitable and the majority of people with glaucoma need eye drops for life.

Tablets

In some cases tablets may be given to reduce the amount of aqueous produced. Initially these tablets increase the amount of urine passed.

Glaucoma and exercise

The Medical Director of the Glaucoma Foundation in the US says that there is research that shows that frequent activity such as swimming or brisk walking can lower the pressure within the eye. But he warns against sports that involve turning upside down - certain yoga positions and scuba diving can raise the pressure. [Health Which? December 2000]

Driving and Glaucoma

If glaucoma is diagnosed then you should inform the DVLA and your motor insurers. It is a condition that should be declared under the item 'has there been any material change that could affect your driving.'

Cataract

Perhaps there are more misunderstandings about cataracts than any other condition of the eye. Many people are frightened and fear that they are going to lose their sight, but understanding what a cataract is helps to offer reassurance.

Facts

- Cataracts usually form slowly with a gradual blurring of vision.
- Cataracts are usually formed as part of the normal aging process but they can be formed as a result of injury to the eye. Cataracts can be present from birth.
- Cataracts are more common in people with diabetes and can develop at an earlier age than in the general population.

- Cataracts cannot be caused by overuse of the eyes and 'resting' the eyes will not stop cataracts from developing or progressing.
- There is no known prevention for cataracts.

What is cataract?

In a normal eye the lens, behind iris and pupil, is clear and transparent but when a cataract forms the lens becomes cloudy or opaque so preventing the light that passes through the pupil from reaching the retina. The image or picture on the retina is fuzzy and blurred.

Cataracts usually develop in adult life and are caused by the normal aging process in which the lens becomes harder and cloudy. As this happens there may be a need to have new, stronger glasses more frequently but when the cataract worsens stronger glasses will not improve vision.

Treatment

Surgery is usually very successful in most people and should be performed when the vision has dropped to the point where it is interfering with daily activities. Even though cataracts usually form in both eyes, the surgery is carried out on each eye at different times with the worst eye being treated first.

What is involved in the surgery?

The surgery is usually carried out without an overnight stay in hospital. Most cataract operations are carried out under local anaesthetic. The lens is removed through a tiny hole in the cornea and a permanent clear plastic lens is implanted. Occasionally very fine stitches are used to close the wound and these may be painlessly removed later.

The implanted plastic lens corrects the vision of the eye but reading glasses are usually needed after the operation.

Note: for some people a plastic lens implant is not suitable in which case a contact lens is fitted or special glasses are prescribed some weeks after the operation to remove the lens.

After the surgery

- After the operation the eye will be covered for protection for up to a day but it is advisable to wear the protective eye shield in bed for a month after the operation.

- Eyelids must be cleaned regularly and drops are given to prevent infection and help to reduce any post-operative inflammation. The drops may be necessary for two months after surgery.
- Rubbing or touching the eyes should be avoided.
- There may be sensitivity to light and dark tinted glasses are useful.
- It is advisable to avoid heavy work or lifting but people not in strenuous occupations should be able to return to work couple of weeks after surgery.
- The eye takes a few weeks to settle down and you will be advised when it is time to have an eye test for glasses.

Macular degeneration

Macular degeneration affects the macula at the back of the eye and impairs central vision. The macula is a small area on the retina where detailed central vision takes place eg reading. The cells in the macula deteriorate and the central part of vision becomes blurred but what is seen around the blurred area is relatively clear because the peripheral area of the retina is not affected.

Who is affected?

Macular degeneration accounts for about 50% of all visual impairment in developed countries. It usually affects people over 50 years and so is known as Age-related Macular Degeneration [AMD].

There are other forms of macular disease which can affect younger people:

- Macular dystrophy, which is damage to the macula, is rare and tends to run in families.
- Macular disease caused by diabetes ie diabetic retinopathy.

Two types of macular degeneration

Dry - develops very slowly over a number of years with gradual fading of central vision.

Wet - develops more rapidly.

Symptoms of macular degeneration

- central vision is reduced and fine detail is difficult to see
- straight lines can appear wavy or misshapen
- judging distances and heights can be difficult
- colour perception may be affected.

Diagnosis

If your optician or GP suspects that you have AMD, then you will be referred to the hospital where you will have one or more of the following checks.

- Look at a grid test page to check for blind spots.
- A colour vision test.
- Photographs of the back of the eye so that the doctor has an accurate record for future comparisons.
- Fluorescein angiogram is used only occasionally. Your pupils are dilated and a small amount of fluorescein dye is injected into a vein your arm. It circulates through the body and so the network of blood vessels at the back of the eye can be seen and if there are any leaks of the dye, then it shows the vessels are damaged or new vessels have developed. This occasionally causes nausea and the skin yellows for 3-6 hours and the urine for up to 24hours.

Treatment

New drugs have been developed called anti-VEGF which are injected into the eye. They prevent the growth of new blood vessels. Currently under the NHS are ranibizumab (Lucentis) and aflbercept (Eylea) but they are only available under certain conditions. You should discuss with your eye specialist whether these are suitable for you. Laser treatment to destroy abnormal vessels may be used occasionally in the wet type if you are seen at the early stages of development and only if the new vessels are not to near the centre of the macula.

New drugs have been developed and you should discuss with your eye specialist whether these are suitable for you and whether they are available under the NHS. Laser treatment may occasionally halt the progress of the wet type if you are seen at the early stages of development.

Notes

Diet - research has shown that people who had regularly a diet with a high glycaemic index [carbohydrates that quickly raise the blood sugar levels] had a significantly increased risk of AMD compared to those who had eaten a diet with a low glycaemic index [slowly absorbed carbs]. The researchers calculated that 20% of AMD cases could have been prevented if the study participants had consumed low glycaemic index diets.

Nutritional Supplements – there have been reports that nutritional supplements may help to treat AMD but they cannot restore vision. The February 2006 issue of Drugs and Therapeutics Bulletin [DTB] expressed concerns that promotion of certain nutritional supplements which claim to improve or slow down macular degeneration may be medicinal and these claims are aimed at people who are worried about macular degeneration.

In particular DTB reported the claim that 'Viteyes' can 'slow macular degeneration'. DTB says that there is some evidence to support the use of a specific combination of antioxidant vitamins and zinc, the so-called AREDS formula, in specific groups of patients with macular degeneration - those with advanced disease in one eye only but this formula can only be found in a few products - 'VisiVite Original Formula', 'Viteyes AREDS Formula' and 'Ocuvite PreserVision'. The use of other nutritional supplements, or use in other groups of people, cannot be recommended.

DTB's advice to people with macular degeneration includes to stop smoking and eat a healthy diet rich in green vegetables.

Driving with eye conditions

The law requires that you must inform the DVLA in Swansea and your motor insurers if there are any changes in health or sight that could affect your ability to drive safely. Failure to do this could result in prosecution and your motor insurance being invalid.

Meeting the driving standards

The DVLA may require a report from your ophthalmologist or your doctor about your eye condition. You must NOT drive until your specialist has confirmed that you meet the required standards. To drive vocational vehicles, the standards are more stringent.

Dry eyes and diabetes

Dry eye is a very common condition that affects many people over 45, especially postmenopausal women. However, people with diabetes have a significantly increased risk of dry eyes.

Symptoms

Gritty, sandy feeling in the eyes, burning, itchy, blurring vision and light sensitivity, redness and oddly, increased watering of the eyes. It usually affects both eyes.

Causes

Tears consist of three layers - an outer oil layer that prevents evaporation of the tears from the surface of the eye, a watery middle layer and an inner mucus layer that allows the middle watery layer to adhere to the surface of the eye. A shortage or abnormality of any of these layers results in the symptoms of dry eyes but the most common cause is insufficient quantity of the water layer produced by the tear [lachrymal] glands under the upper rim of the eye socket.

Causes in people with diabetes - research suggests that dry eyes in people with diabetes are caused by insufficient production of tears due to autonomic neuropathy affecting the nerves that control the lachrymal [tear] glands. Autonomic neuropathy is nerve damage that affects the involuntary nerves.

When the front surface of the eye [the cornea] is no longer sufficiently lubricated the cells of the cornea become damaged and free nerve endings are exposed, leading to dry eye symptoms. If the nerves of the cornea are severely damaged, then there may be relatively few symptoms. This is dangerous as the pain is a warning that something is wrong.

Treatment

Keeping blood glucose levels as tightly controlled as possible is the first step in both prevention and treatment of dry eyes but there are various medical treatments. These include artificial tears, medications to increase tear production by the lachrymal glands or blockage of the tear ducts to prevent the tears draining away through the nose. It has also been shown that increasing the amount of omega 3 fatty acids [oily fish] in the diet can increase the quantity and quality of tears.

The health professionals involved in eye care

Dispensing opticians – are qualified to fit and measure for glasses and to examine conditions that affect the outside of the eye. They are not allowed to test the eyes for glasses or to examine the inside of the eye – for example with an ophthalmoscope. They are allowed to fit and supply contact lenses to a supplied prescription.

Ophthalmic Opticians or Optometrists – are different titles for the same qualifications. This group is qualified to fully examine the eyes. If there are any abnormalities or suspected abnormalities then they refer the person to their GP or directly to the hospital. They also test for glasses and fit and supply them. They may be 'high street' opticians or hospital based.

Note: If you have diabetes and you are not on an eye screening programme, it is important that your optician/optometrist carries out an eye examination with drops to enlarge the pupil so that he/she can observe more of the retina. If necessary, you should ask for this to be done.

Consultant Ophthalmologist – this is the hospital consultant to whom the GP refers people with suspected abnormalities and he/she carries out the necessary treatment or surgery.

Tips for people with visual impairment

Visual difficulties can affect people with or without diabetes but the one thing that insulin-treated people have to do is be able to inject the accurate amount of insulin. While visual difficulties may not prevent many activities, not being able to do your own injections [and blood glucose tests] results in a loss of independence, especially for people who live alone. There are also many everyday things that fully sighted people take for granted but these become difficult or impossible for people with visual impairment.

Alison Blackburn has had diabetes for many years and is visually impaired as a result of diabetic retinopathy. She shares with us some of the tips she has picked up over the years that her sight was deteriorating that have enabled her to maintain her independence and ability to do many of the everyday things in life.

Tips for injecting your insulin

Using an pen injection device

- There are a variety of pens available and they have clicking devices so that you can count the clicks to know how many units you are injecting.
- There are pre-filled disposable pens available for most brands of insulin and this means that you do not have to re-load the pen when a cartridge runs out. This can be easier for people with visual impairment [and for people with hand movement problems].

Here are tips for people who prefer to inject with a syringe

- Syringe magnifiers that slot over a disposable syringe are available.
- If you take the same dose of insulin regularly, score the outside of the syringe at your dose and then draw up to this mark. If you take two different doses, morning and evening, score two syringes but make sure you keep them in different places.
- If seeing the clear insulin is difficult then hold a coloured card behind the syringe for a better contrast making sure that the colour is one that you can see well. If you 'haven't enough hands' pin the card to the wall or a door.
- Syringes are available in different sizes, 100ml, 50ml and 30ml. If your dose is small enough choose the smallest size syringe because the markings are further apart and easier to see - 30ml are easier to see than 50ml and 50ml easier than 100ml.
- A nurse or relative can draw up a week's supply of insulin in syringes and leave them in the fridge. Again if the dose or type of insulin is different at different times of the day, make sure that the morning syringes are stored on the top shelf and the evening ones on the bottom shelf. If using longer-acting cloudy insulin, then make sure that you roll the syringe about 20 times to ensure that the insulin is mixed properly before injecting.

Gas and electricity companies

If visual impairment is developing then gas and electric companies will fit tactile buttons to cookers and other household equipment, such as fires and microwaves. The larger companies are often happy to do this free of charge but if you are registered with Social Services, they are obliged to organise this for you.

A talking blood glucose meter

GlucoRx - Nexus Voice

The GlucoRx Nexus Voice is a talking blood glucose meter that can help people with visual impairments, such as retinopathy, which may make it hard to read meter results. The talking function guides the user through a test and can read out results from the meter's test memory. The meter has just one main button making it simple to use for the basic tasks. The Nexus Voice meets the 2013 ISO standards for blood glucose meter accuracy.

Key features

The main features of the GlucoRx Nexus Voice are:

- Spoken guide to testing and spoken results.
- Test strip eject button.
- Allows for alternate site testing.
- Before and after meal markers can be set.
- Ketone warning if results are 15 mmol/l or above.
- PC link allows results to be uploaded to a computer.

The Royal Institute for the Blind [RNIB] offers many different services to help people who are blind or visually impaired.

Helpline: 0303 123 9999 Website: www.rnib.org.uk

IDDT Newsletter and Type 2 & You

are available in different formats on request. If you would like further information or know someone that would, then please let us know in any of the following ways:Tel 01604 622837, e-mail enquiries@iddtinternational.org or in writing to: IDDT, PO Box 294, Northampton NN1 4XS.

InDependent Diabetes Trust
PO Box 294 Northampton NN1 4XS

For further information about all our FREE leaflets contact us:

Telephone: 01604 622837
Email: enquiries@iddtinternational.org
www.iddt.org

Charity Number 1058284 Registered Number 3148360