

Diabetes Research & Wellness Foundation

Eye health and diabetes

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Staying well until a cure is found...



What is diabetes-related retinopathy?

High blood glucose levels in diabetes can damage the blood vessels in the tissue at the back of your eye (retina), which is responsible for your vision. The blood vessels become weak and will leak fluid into the layers of the retina. The fluid can build, causing swelling. If the swelling is near the area responsible for your central vision (fovea), this is known as **diabetes-related maculopathy**.

As well as causing fluid to leak, high blood glucose can cause vessels to become blocked. This means less oxygen gets to the retina. This causes a growth hormone known as VEGF (vascular endothelial growth factor) to increase and abnormal blood vessels to grow on the retina (**proliferative diabetes-related retinopathy**). These new vessels grow into the gel in the middle of the eye and bleed.

If left untreated, both maculopathy and proliferative retinopathy can cause vision loss and blindness.



What causes diabetes-related retinopathy and maculopathy?

High blood glucose levels and high blood pressure are the main risk factors for the development of retinopathy and maculopathy. For every 1% (11mol/mol) reduction in HbA_{1c} levels the risk of developing retinopathy reduces by 40% and developing sight-threatening retinopathy by 25%. For every 10mmHg decrease in blood pressure the risk of developing sight-threatening retinopathy reduces by 35%.

While lowering blood glucose and blood pressure levels reduces the risk of developing diabetic retinopathy it does not eliminate the risk. This is because there are other things involved such as genetics which we do not know enough about.

Caution – if HbA_{1c} is high and you have retinopathy or maculopathy, reducing the HbA_{1c} too quickly can cause retinopathy and maculopathy to get worse.

Who is at risk?

Anyone with diabetes is at risk of developing retinopathy or maculopathy – both type 1 and type 2 diabetes as well as other forms such as maturity-onset diabetes of the young (MODY), latent autoimmune diabetes in adults (LADA) and type 3c diabetes (caused by other medical conditions affecting the pancreas) but not gestational diabetes. The longer you have diabetes the higher the risk of developing retinopathy or maculopathy. However, most people who develop retinopathy will develop the mild non-sight-threatening forms. For those who do develop the sight-threatening levels of retinopathy or maculopathy there is treatment available. Therefore, developing retinopathy does not mean you will lose your vision. Sight loss due to diabetes is preventable and the best way to protect yourself is through **self-care** and attending **healthcare appointments**.

Self-care

Maintaining a healthy balanced **diet** and taking regular **exercise** can help regulate blood glucose levels and maintain a healthy weight. In addition, **taking your medications** as prescribed can help manage **blood glucose** and **blood pressure** levels, all of which help to reduce your risk of developing complications such as retinopathy.

Peer support in diabetes can be valuable for managing the day-to-day challenges of living with diabetes. It can provide a unique and empathetic environment promoting a sense of community, understanding and empowerment, decreasing the sense of loneliness and isolation from living with a long-term condition.

Healthcare – in addition to self-care, attending regular appointments to check on the health of your eyes is vital.

Opticians are there to monitor the overall health of your eyes and vision. Diabetes means you have a greater chance of developing other eye conditions such as cataracts and glaucoma. These conditions, as well as many others, and your vision are all monitored by your optician. Therefore, you should make sure you attend your optician on a regular basis. Opticians can also help if you develop a sudden change in your vision that you are concerned about.



Diabetic eye screening monitors the health of the back of your eye (retina). It is important to attend diabetic eye-screening appointments as studies have shown that treatment for proliferative retinopathy is more effective before visual symptoms occur. Diabetic eye screening can detect the early changes, allowing you to make changes to your self-care routine to prevent retinopathy worsening and to get treatment as soon as it is needed.



Results from screening can be confusing

Here we explain what they mean in more detail:

- **Fovea** – responsible for central vision and fine detail for things like reading.
- **Macula area** – a circular area around the fovea where changes due to diabetes could threaten the central vision.
- **Optic disc** – also known as the blind spot where all the blood vessels enter and exit the eye.

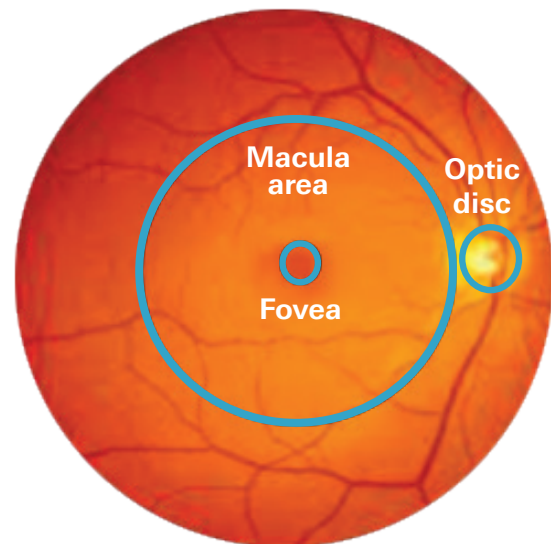


Figure 1: Illustration of the back of an eye (retina) with the main features highlighted

Your eyes will be given a combination of retinopathy (R) and maculopathy (M) grades during screening. These are described in more detail below.

No diabetic retinopathy (R0)

No changes in the eye due to diabetes. People with no diabetic retinopathy at their first screening will be recalled in 12 months for a second screening. If this second screening also detects no diabetic retinopathy they will be considered low risk of developing sight-threatening diabetic retinopathy and recalled every 2 years. For more information visit: www.gov.uk/government/publications/diabetic-retinopathy-description-in-brief/your-guide-to-diabetic-retinopathy.

Background diabetic retinopathy (R1) (mild non-proliferative retinopathy)

Vessels become blocked or leaky causing blood and other fluid to become visible on the retina. These changes are not sight-threatening and will not affect your vision but improvements in self-care may help to reduce the risk of retinopathy getting worse. People with background retinopathy will be recalled in one year for screening.

Pre-proliferative diabetic retinopathy (R2) (moderate/severe non-proliferative retinopathy)

More changes due to diabetes are visible on the back of the eye. This could be more bleeds, as well as signs of a lack of oxygen and changes in the shape of blood vessels themselves. The risk of sight-threatening changes developing have increased. Therefore, you could be screened more often, every three to six months, or would be referred to a specialist for more testing and closer monitoring (see **Additional healthcare**). These changes will not affect your vision but improvements in self-care may help to reduce the risk of retinopathy getting worse.



Pre-proliferative retinopathy low (R2L) and high risk (R2H)

Pre-proliferative retinopathy can be sub-divided into two further categories; lower risk (R2L) and higher risk (R2H). People with R2L would remain within screening at digital surveillance clinics. Additional images (seven fields in total) to cover a wider area of the retina are taken initially at 3 months with follow up appointments ranging from 3, 6, 9 and 12 months. People with R2H are referred to their local hospital eye service (HES) to be monitored there.

Proliferative diabetic retinopathy (R3)

At this stage the growth hormone known as VEGF is increased and abnormal blood vessels grow on the retina. These new vessels grow into the gel in the middle of the eye and bleed. Once they bleed, they will begin to affect sight causing black spots in your vision or an increase in floaters. You will be referred to a specialist for testing (*see **Additional healthcare***) and possibly need **treatment** to stop the new vessels from growing.

Proliferative retinopathy can be active (R3a) or stable (R3s)

The active form of proliferative diabetic retinopathy is when the vessels are growing and may be bleeding. The stable form is when the retina has had treatment, and no new vessels are growing or bleeding.

No maculopathy (M0)

No changes due to diabetes within the macular area (*see **Figure 1***). If the retinopathy level is R0 or R1, screening recall would be based on the retinopathy level.

Maculopathy (M1)

Changes due to diabetes can be seen within the macular area. Vessels in or around the macula area become blocked or leaky. When blood and fluid leaks into the macula it can cause swelling, called oedema. Because the fovea is responsible for our central vision and being able to read, swelling in this area has a higher risk of threatening sight. People with diabetic maculopathy will require further pictures to be taken with an Optical Coherence Tomography (OCT) camera. This will determine whether there is any fluid leaking and how much. Some screening programmes have OCT cameras and you will be invited back to a digital surveillance clinic. Other programmes do not have OCT and you may be referred to ophthalmology or an optometrist to have these images taken (*see **Additional healthcare***). If swelling is detected, then **treatment** would be needed to reduce the swelling and limit the effect on vision.

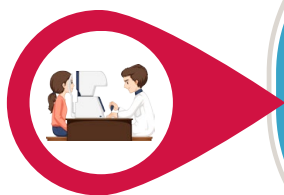
People with signs of maculopathy can be kept under the care of screening programmes within their digital surveillance clinics. They would be recalled over 3, 6, 9 and 12 month periods. If screening includes OCT then people would be referred into HES once signs of swelling are seen. For programmes without OCT people will be referred into HES for the OCT imaging, following which they could be discharged back to screening, monitored in HES or need treatment.

Diabetes and eye health

The journey to preventing sight loss

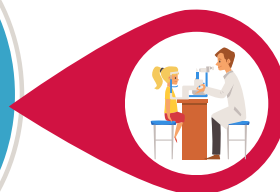
Self-management

- Diet
- Exercise
- Taking medications as prescribed
- Checking blood glucose levels



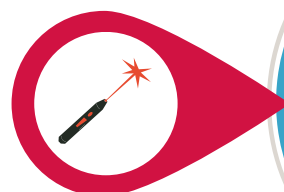
Healthcare

- Diabetic eye screening every 2 years or 1 yearly
- Results
- Opticians



Additional healthcare

- More frequent eye screening 3–6 months
- Referral to ophthalmology for further tests/monitoring



Treatment

- Laser
- Anti-VEGF (anti-vascular endothelial growth factor)
- Steroid implants
- Eye surgery

Support services

- Charities (DRWF, Macular Society, Royal National Institute of Blind People, etc)
- Eye Care Liaison Officers (ECLOs)
- Vision aids



Key

Things can go wrong in healthcare systems and can easily get off track. If you do not receive your expected appointment, please contact your healthcare professional to check



Protect your eyes

- Self-management prevents and delays diabetes affecting your eyes
- Attend diabetic eye screening and opticians appointments to pick up any changes as early as possible

Additional healthcare

Treatment

There are four different treatment options for diabetic retinopathy and diabetic macular oedema.

Laser, also known as photocoagulation (pan retinal, meaning a wide area of the retina, and focal, meaning small focused areas of the retina), is a medical procedure that uses a focused beam of light that is applied to the retina to treat the affected area. The laser creates tiny burns on the retina. These help seal leaking blood vessels, reduce swelling and, in some cases, reduce the growth of the new blood vessels. The aim of laser treatment is to stabilise the changes in your eyes caused by diabetes and prevent further vision loss. Laser treatment does not usually improve your sight, although some people might notice an improvement. If the changes are not treated, it is likely that some, or all, of your sight may be lost. Depending on how the condition responds, further laser treatment may be needed throughout a person's lifetime.

Anti-VEGF is a medicine that is injected into the eye following numbing with anaesthetic drops, so you should not feel pain. This treatment works by blocking a substance called VEGF, which can cause the growth of abnormal new blood vessels and leaking of fluid from blood vessels. This helps to stabilise and sometimes improve vision. Anti-VEGF injections are normally used to treat diabetic maculopathy (diabetic macular oedema) and sometimes proliferative diabetic retinopathy. Treatment usually involves monthly injections at first and then less often once the condition is under control. Regular check-ups are important to monitor your progress.

Steroid implants are small devices that can be placed inside the eye and slowly release small amounts of steroid medicine over time. The eye is numbed beforehand, so the procedure should not be painful. The steroids help to reduce inflammation and swelling in the retina, which can improve or stabilise vision. The implants are designed to gradually dissolve over time, releasing controlled amounts of steroid as they break down, reducing the need for frequent injections. Steroid implants can last between three and six months. However, they may increase the risk of cataracts and glaucoma.

Vitrectomy is an operation where the gel inside the eye (called the vitreous) is removed. This gel normally fills the space between the lens at the front of the eye and the retina at the back. The aim is to reduce damage and protect vision, although it may not always restore sight. This is performed under local or general anaesthetic. This is a treatment option that is considered after laser and anti-VEGF have not been enough or there are serious problems, like bleeding inside the eye (vitreous haemorrhage), or scar tissue pulling on the retina (tractional retinal detachment).

Signs and symptoms of visual problems

The early stages of diabetic retinopathy have no signs or symptoms, which is why screening is needed. In the late stages the signs of visual problems that require immediate investigation include:

- **Blurred vision**
- **Sudden reduction in vision**
- **Spider web-type appearance in vision**
- **Sudden increase in floaters**
- **Flashing lights**
- **A dark curtain over vision**

These may appear in one or both eyes. These need to be checked by an eye health specialist such as an optician or ophthalmologist immediately. Your optician can check the back of your eye and refer you to an ophthalmologist for further assessment, or you can attend eye casualty where you will be seen by an ophthalmologist.

More information

To find out more about eye health and diabetes, visit:

NHS diabetic retinopathy overview www.nhs.uk/conditions/diabetic-retinopathy/

Royal National Institute of Blind People www.rnib.org.uk

Macular Society www.macularsociety.org



The Diabetes Research & Wellness Foundation works towards educating, informing and reminding you of the best and healthiest choices to make.

If you would like to become part of our Diabetes Wellness community, visit our website for more details.

www.drwf.org.uk

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