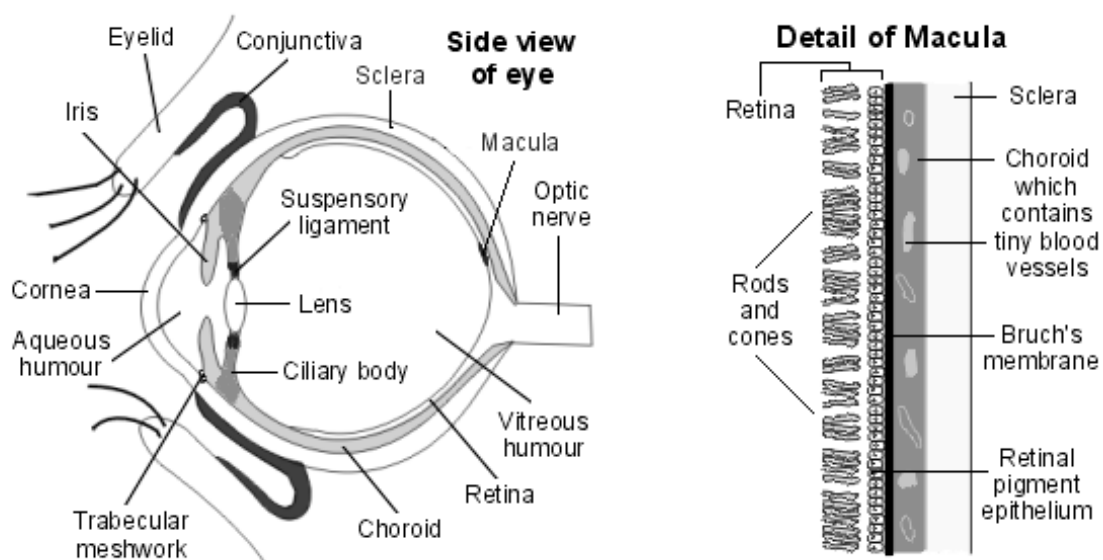


Age-Related Macular Degeneration

Age-related macular degeneration (ARMD) causes a gradual loss of central vision, but not peripheral vision. Central vision is needed for reading, driving, recognising faces and doing detailed work. The decline to severe loss of vision can vary from months to years - depending on the type and severity of ARMD. Visual loss caused by ARMD cannot be reversed. However, in a small number of cases, treatment may halt or delay the progression of visual loss.

Understanding the back of the eye

When you look at an object, light from the object passes through the cornea, then the lens, and then hits the retina at the back of the eye.



- **The retina** is basically made up of two layers. There is an inner layer of 'seeing cells' called rods and cones. These cells react to light and send electrical signals down tiny nerve fibres (which collect into the optic nerve) to the brain. The outer layer - the retinal pigment epithelium - is a layer of cells behind the rods and cones. These cells help to nourish and support the rods and cones. They pass nutrients from the blood vessels in the choroid to the rods and cones. They also take waste materials from the rods and cones to the blood vessels in the choroid.
 - The cone cells ('cones') deal with colour vision.
 - The rod cells ('rods') enable you to see shades of grey.
- **The macula** is a small but vital area of the retina at the back of your eye. It is about 5 mm in diameter. The very centre of the macula is called the fovea. The macula is the part of the retina that is the most densely packed with 'seeing cells' - especially cones.
- **The choroid** is a layer of tissue behind the retina which contains many tiny blood vessels. These help to take oxygen and nutrients to the retina.
- **Bruch's membrane** is a thin membrane which helps to form a barrier between the choroid and the delicate retina.
- **The sclera** is the outer thick white layer of the eye.

When you look at an object, the light from the object focuses on the macula. You need a healthy macula for detailed central vision such as when reading, writing, driving and recognising faces. The rest of the retina is used for peripheral vision - the 'side' vision which is not focussed. Therefore, without a macula you can still see enough to get about, be aware of objects and people, and be independent. However, the loss of central vision will severely affect normal sight.

What is age-related macular degeneration (ARMD)?

Age-related macular degeneration (ARMD) is a condition that occurs when cells in the macula degenerate. That is, they become damaged and die. Damage to the macula affects your central vision which is needed for reading, writing, driving, recognising people's faces and doing other fine tasks. There are two types - 'dry' and 'wet' ARMD - described below.

Who gets age-related macular degeneration?

ARMD is the most common form of macular degeneration and develops in older people. (There are other rare types of macular degeneration which occur in younger people.) ARMD can affect anyone. It is the most common cause of severe sight problems ('visual impairment') in the UK. It becomes more common with increasing age. If you develop ARMD in one eye, you have a high chance that it will also develop in the other eye.

About 1 in 100 people aged 65-75, and about 1 in 8 people aged over 85 have ARMD severe enough to cause serious visual loss. About twice as many women over the age of 75 have ARMD compared to men of the same age.

The two types of age-related macular degeneration

Dry age-related macular degeneration (dry-ARMD)

This is the most common form and occurs in 9 in 10 cases. In this type the cells in the retinal pigment epithelium of the macula gradually become thin (they 'atrophy') and degenerate. This layer of cells is crucial for the function of the rods and cones (the 'seeing cells') which then also degenerate and die. Typically, dry ARMD is a very gradual process as the number of cells affected increases. It usually takes several years for vision to become seriously affected. Many people with dry-ARMD do not totally lose their reading vision.

Wet age-related macular degeneration (wet-ARMD)

This occurs in about 1 in 10 cases. However, it is likely to cause severe visual loss over quite a short time - sometimes just months. In this type of ARMD, in addition to the retinal pigment cells degenerating, new tiny blood vessels grow from the tiny blood vessels in the choroid. (This is called 'choroidal neovascularisation'.) The new vessels break through Bruch's membrane and into the macular part of the retina. These vessels are not 'normal'. They are fragile and tend to leak blood and fluid. This can damage the rods and cones, and cause scarring in the macula.

What causes age-related macular degeneration?

In people with ARMD the cells of the retinal pigment epithelium do not work so well with advancing age. They gradually fail to take enough nutrients to the rods and cones, and do not clear waste materials and 'by-products' very well made by the rods and cones. As a result, tiny abnormal deposits called 'drusen' develop under the retina. In time the retinal pigment cells and their nearby rods and cones degenerate, stop working and die. This is the 'dry' type of ARMD.

In some cases, something also triggers new blood vessels to develop from the choroid to cause the 'wet' form of ARMD. The trigger is not known. It may be that some waste products which are not cleared from the retinal pigment epithelium may stimulate new blood vessels to grow in an attempt to clear the waste.

The exact reason why cells of the retinal pigment epithelium stop working properly in people with ARMD is not known. Certain 'risk factors' increase the risk of developing ARMD. These include:

- Smoking.
- Possibly, high blood pressure (inconclusive evidence).
- A family history of ARMD. (ARMD is not a straightforward hereditary condition. However, your risk of developing ARMD is increased if it occurs in other family members.)

What are the symptoms of age-related macular degeneration?

- The main early symptom is blurring of central vision despite using any glasses that you need. In the early stages of the condition you may notice that:
 - You need brighter light to read by.
 - Words in a book or newspaper may become blurry.
 - Colours appear less bright.
 - You have difficulty recognising faces.
- A particular early symptom to look out for with wet-ARMD is visual distortions. Typically, straight lines appear wavy or crooked. (For example, the lines on a piece of graph paper, or the lines between tiles in a bathroom, or the border of any other straight object, etc.)
- A 'blind spot' then develops in the middle of your visual field. This tends to become larger over time as more and more rods and cones degenerate in the macula.

ARMD is painless. Symptoms of dry-ARMD tend to take 5-10 years to become severe. However, severe visual loss due to wet-ARMD can develop over weeks or months. Therefore, see a doctor or optometrist quickly if you develop visual loss or visual distortions as treatment may be possible. Peripheral vision is not affected with ARMD and so it does not cause total blindness.

Note: if the vision of one eye only is affected, you may not notice any symptoms as the other good eye often compensates. When both eyes are affected you are more likely to notice symptoms. Therefore, older people should have regular eye checks to check on each eye separately for early ARMD (and to check for other eye conditions such as glaucoma.)

How is age-related macular degeneration diagnosed?

If you develop symptoms suggestive of ARMD your doctor or optometrist will refer you to an eye specialist (ophthalmologist). The specialist may ask you to look at a special piece of paper with horizontal and vertical lines. If you find that any section of the lines are missing or distorted then ARMD is a likely cause of the visual problem. The ophthalmologist will examine the back of your eye with a magnifier. There are typical changes that occur with dry-ARMD and wet-ARMD which can often be seen.

If wet-ARMD is diagnosed or suspected, then a further test called fluorescein angiography may be done. For this test a dye is injected into a vein in your arm. Then, by looking into your eyes with a magnifier and taking pictures with a special camera, the ophthalmologist can see where any dye leaks into the macula from the abnormal leaky blood vessels. This test can give an indication of the extent and severity of the condition.

Is there any treatment for age-related macular degeneration?

- For the common dry-ARMD - there is no treatment. However, remember that in this type of ARMD the visual loss tends to be very gradual, over 5-10 years or so.
- For the less common wet-ARMD - no treatment can reverse the visual loss that has already occurred. However, in some cases treatment may halt or delay the progression of visual loss. Treatments which may be considered are laser photo-coagulation and photodynamic therapy.

Laser photo-coagulation

This is a technique where a fine laser is 'fired' at the tiny new blood vessels that are forming. This destroys the blood vessels which helps to prevent the condition from getting worse. However, this technique is only suitable for a small number of cases, depending on exactly where the new blood vessels are growing as the laser may also damage the rods and cones.

Photodynamic therapy

This is a newer technique. A drug called verteporfin is injected into a vein on the arm. Within a few minutes the verteporfin binds to proteins in the newly formed abnormal blood vessels in the macula. A light at a special wavelength is then shone into the eye for just over a minute.

Verteporfin is a photosensitive drug. This means that when light is shone at the blood vessels coated with verteporfin, the verteporfin 'activates' and causes damage and destroys the abnormally growing blood vessels (without damaging the nearby rods and cones).

Photodynamic therapy is only suitable for a small number of cases. It depends on exactly where the new blood vessels are growing and their extent. It does not work in all cases although the success rate in treated people is high. It usually needs to be repeated every few months to continue to suppress newly growing blood vessels.

Other treatments

Treatments such as radiation therapy, other drugs, and surgery to the retina are being investigated. Their value at present is not clear.

Practical help

When your vision becomes poor, it is common to be referred to a low vision clinic. Staff at the clinic provide practical help and advice on how to cope with poor vision. For example, advice about:

- Magnifying lenses, large print books, and bright lamps which may help with reading.
- Gadgets such as talking watches and kitchen gadgets which can help when vision is limited.
- Being registered as partially sighted or blind. You may then be entitled to certain benefits.

Can age-related macular degeneration be prevented?

There is no way of predicting who will develop ARMD. Not smoking, and treating any high blood pressure may reduce the risk. Some studies also suggest that diet may have a part to play.

Diet, dietary supplements, and ARMD

Some evidence suggests that people who eat a diet rich in antioxidant vitamins (carotenoids such as lutein and zeaxanthin, and vitamins C and E) or minerals (selenium and zinc) may be less likely to develop ARMD. However, the conclusion of a recent review of the evidence states: "There is no evidence to date that people without age-related macular degeneration should take antioxidant vitamin and mineral supplements to prevent or delay the onset of the disease. The results of five large ongoing trials are awaited."

As regards treating existing ARMD, there is some research evidence to say that certain vitamins and other dietary supplements may help to slow the progression of existing ARMD. Again, the evidence is weak and not 'clear-cut'. At present, some doctors think it may be beneficial, but there is some concern over the safety of the doses used in the research trials. Research is in progress to clarify the role of dietary supplements in treating ARMD. Your eye specialist is the best person to give you up-to-date advice on whether you should take any dietary supplements.

However, it seems sensible to eat a normal balanced diet with plenty of fruit and vegetables to make sure you have at least the normal recommended daily intake of vitamins and minerals. Try to include at least 2-4 portions a week of dark green leafy vegetables such as spinach and kale. These contain the greatest amounts of antioxidants.

Further help and information

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Comprehensive patient resources are available at www.patient.co.uk