



# AGE-RELATED MACULAR DEGENERATION





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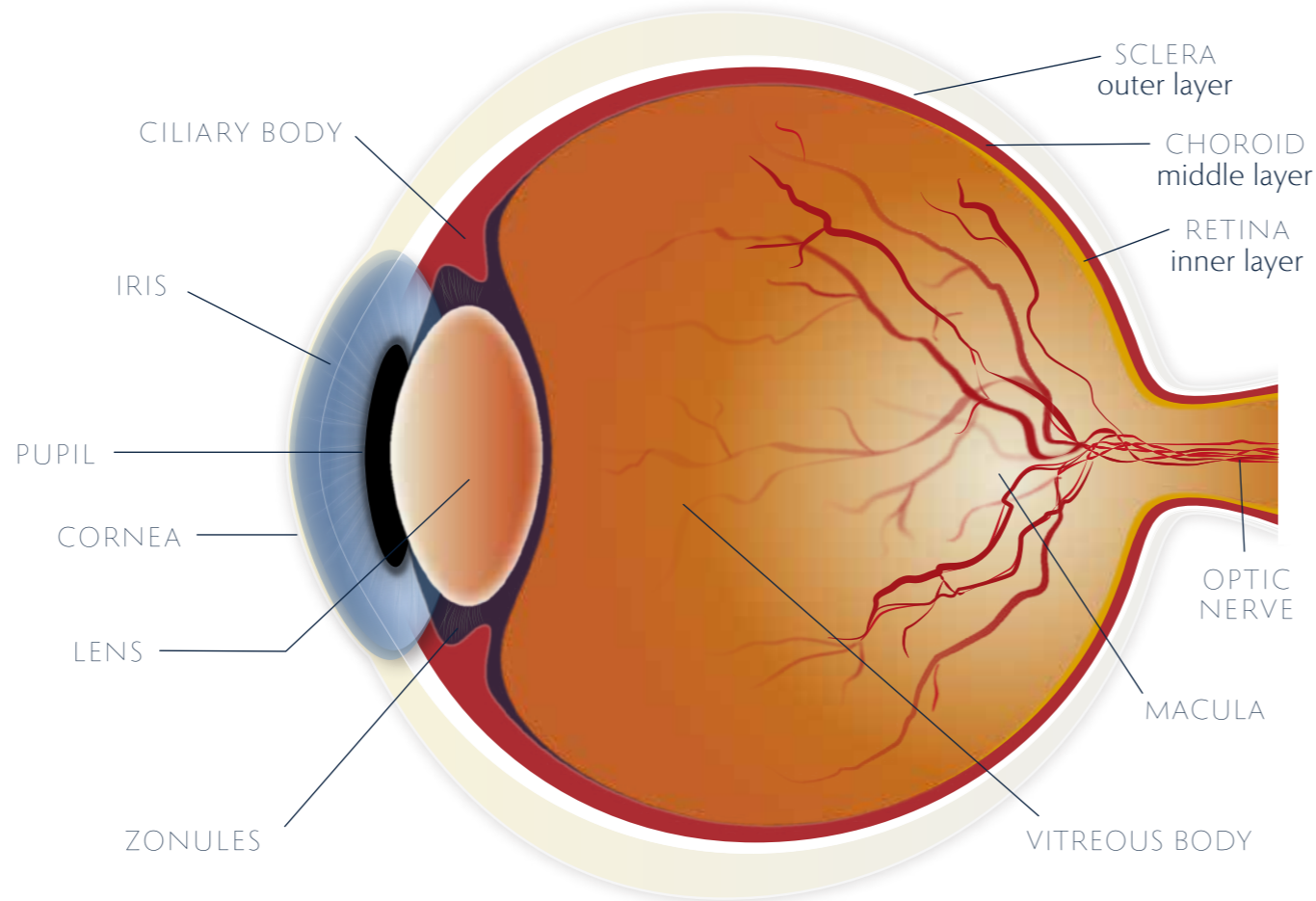
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# anatomy

## EYE ANATOMY

It is helpful to know a little about the eye and how it works in order to understand the effect age-related macular degeneration has on your vision, and how it can be treated.



The cornea forms the clear window into the eye. The iris, which is the coloured part of the eye with the black pupil in the middle, is behind the cornea. The lens lies behind the iris. The wall of the eye is formed by three layers – the retina, the choroid and the sclera. The retina is the light-sensitive nerve tissue that lines the inner wall of the eye. Rays of light enter the eye, passing through the cornea, pupil and lens before focusing on to the retina. The retina contains photoreceptors which convert light into electrical impulses.

In a healthy eye, these impulses are sent via the optic nerve to the brain, where sight is interpreted as clear, bright, colourful images. The retina can be likened to photographic film in a camera. The retina lies on a layer of supporting tissue known as retinal pigment epithelium or RPE. The RPE is important as it nourishes the photoreceptors and removes their waste products.

The macula is a small area at the centre of the retina. It is very important as it is responsible for our central vision. It allows us to see fine detail for activities such as reading, recognising faces, watching television and driving. It also enables us to see colour. The choroid is the underlying vascular (blood vessel) layer of the eye from which the photoreceptors of the retina receive oxygen and nutrients.

# what is AMD?

(AGE-RELATED MACULAR  
DEGENERATION)

02.



Age-related macular degeneration (AMD) is a disease causing progressive damage to the macula, the central area of the retina. It is the most common cause of visual impairment in people over the age of 65. There are two types of macular degeneration, wet and dry.

In AMD, the extent of the degeneration may be different in each eye and may not progress at the same rate.

# WHAT IS DRY AMD?

## (ATROPHIC) MACULAR DEGENERATION

Drusen are accumulated waste products from the retina which, as they get larger, stop the flow of nutrients to the retina. Drusen cause the layer of supporting cells beneath the retina to become very thin. When cells in this layer (the retinal pigment epithelium) die, the overlying macula degenerates and loses its visual function. This type of degeneration is called dry macular degeneration because

there is no leaking of fluid or blood. Over time – sometimes many years – the disease process worsens, with more of the macula being affected.

This degeneration is called geographic atrophy and may be considered the end stage of the dry form of the disease. The dry type is much more common, but with many people maintaining useful vision.



# WHAT IS WET AMD?

## (EXUDATIVE) MACULAR DEGENERATION

Most AMD patients start with the dry form. Ten per cent of these people will go on to develop the wet form of the disease. Although the wet type is much less common, it tends to be more aggressive, causing greater and more rapid visual loss. In response to the retinal degeneration, new blood vessels from the choroid (the deeper vascular layer of the eye) sometimes develop beneath the retina, like weeds growing up through the cracks in a pavement. This process is called neovascularisation.



Neovascularisation does not help the retina, as the vessels are very fragile and easily leak or bleed. Eventually this process results in the formation of a disc-shaped grey scar in the middle of the visual field. The scar may take some time to form, but once established, all retinal tissue in the area is destroyed, leaving a large central blind spot. This is often referred to as a 'disciform scar'. Macular degeneration cannot be reversed once this has occurred. There are two types of neovascularisation, the difference being apparent on special tests such as fluorescein angiography (which will be explained later). One is called 'classic', in which the new vessels develop in a clear and well-defined manner. The second form of wet AMD is called 'occult', where the new vessels are hidden in deeper layers and are poorly defined. This was important with previous laser treatments, but with modern injection therapies, this is now much less relevant.

# what causes

## AGE-RELATED MACULAR DEGENERATION?

Although the cause of AMD is currently not fully understood, a number of risk factors have been identified.

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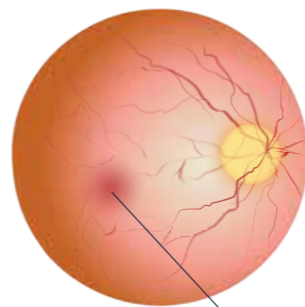
- **Age.** This is the main risk factor for developing AMD. As you age, your risk of developing the condition increases.
- **Genetics.** Although there is rarely a strong hereditary pattern, it is known that people with a family history of macular degeneration have an increased chance of developing AMD.
- **Smoking.** In a number of studies, smoking has been linked to the development of AMD. It has been shown that stopping smoking can reduce the risk.
- **High blood pressure.** Studies have shown that high blood pressure is linked to the likelihood of developing AMD.
- **Nutrition.** The fragile cells of the macula are highly susceptible to damage from oxygen-charged molecules called free-radicals. It has been shown that people who have a low intake of antioxidants (nutrients that fight the damaging effects of free-radicals) may be at an increased risk of developing AMD. Excessive alcohol consumption may also deplete the level of antioxidants in the body.
- **Sunlight.** The cells of the macula are highly sensitive to sunlight, and cell damage from the sun can lead to deterioration of the macula. The use of good quality sunglasses helps to protect the eyes from this risk.
- **Gender.** Women are more susceptible to developing AMD than men.

# 04. symptoms

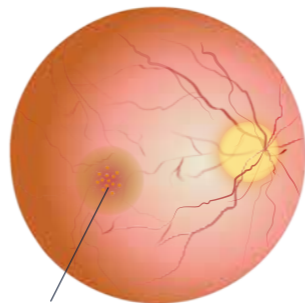
## HOW DOES AMD AFFECT YOUR SIGHT?

The earliest sign of macular degeneration is often the appearance of small yellow deposits called drusen, which form under the retina. The presence of drusen does not necessarily mean that a person will have visual problems. Drusen can be found in younger people who do not have macular degeneration.

Over time, however, the drusen can become larger and increase in number. The pigmental layer of the eye can also be disturbed, leading to a 'patchy' appearance (atrophy). When drusen or atrophy are accompanied by a decrease in vision, the term macular degeneration is used.



NORMAL MACULA  
(centre of retina)



DRUSEN

Comparison of a normal  
macula and a macula  
with degeneration



## COMMON SYMPTOMS OF AMD:

- Blurred vision.
- Distortion of straight lines.
- A dark spot in the central vision.
- Objects appearing the wrong shape, size or colour.
- Objects moving or disappearing.
- Awareness of a dark patch in the centre of your vision upon waking.
- Difficulty in bright sunlight and dim lighting.

# 05.

AMD

## investigations

### VISION ASSESSMENT

Each time you come to clinic your vision will be checked. You will be given eye drops to dilate your pupil, which allows your retina to be examined. These drops take about twenty minutes to work and their effect may last several hours. Your vision will be blurred for a while, and your eyes may be temporarily sensitive to light. It is advisable not to drive to clinic appointments.

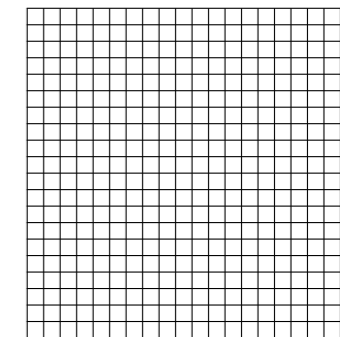


### THE AMSLER GRID

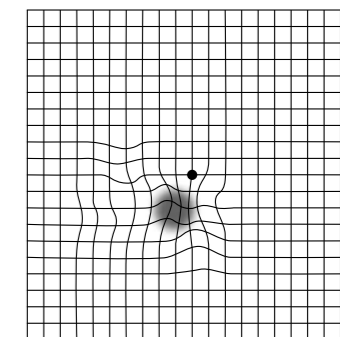
The Amsler grid is used to test your vision in an effort to detect any changes occurring at the macula. While some change will be apparent in dry disease, use of the Amsler grid is essential in wet disease where it is important to identify any deterioration at the earliest opportunity.

- The grid should be held about twelve inches away from your face.
- While wearing the glasses you use for reading, cover one eye at a time with the palm of your hand.
- With the uncovered eye, stare at the dot in the centre of the grid.

All four corners of the grid should be visible and the lines of the grid should appear straight and unbroken. If you see any holes or blurry spots, or the lines look wavy, fuzzy, crooked or broken, you should be seen within a few days.



NORMAL



ABNORMAL



### **OCT SCANNING**

OCT stands for optical coherence tomography. The picture obtained is essentially a cross-sectional slice, taken through the layers of the retina and the eye wall on which it sits. OCT is quick, completely safe and totally painless. It does not involve any injections or x-rays. The quality of images produced by OCT has completely changed the way we diagnose and treat many retinal conditions.

#### **What do I need to do before the test?**

You should not drive to clinic. When you arrive you will have your vision assessed and dilating drops will be put into your eyes.

#### **How long will I be at the clinic?**

You can expect to be at the clinic for about one hour. The dilating drops take approximately 20 minutes to take effect. The OCT scan takes about 10 to

15 minutes to complete.

#### **What does the test involve?**

You will be asked to place your chin on a rest very similar to the slit lamp (microscope) used in a routine eye examination. You look into a small box and will be asked to focus on a dot or line while the test is carried out. It is no more difficult than having a photograph taken.

### **FLUORESCEIN ANGIOGRAPHY**

Fluorescein angiography is a photographic test using a specialised camera system and a photosensitive dye. It is not an x-ray and the dye used is an orange vegetable dye, not iodine-based like those used in x-rays and scans.

#### **What do I need to do before the test?**

There is no special preparation for the test. You may eat and drink as normal,

and it is important you take your regular medication. It is advisable to bring someone with you – you should not drive to clinic. When you arrive, your vision will be assessed and dilating drops will be put into your eyes.

#### **How long will I be at the clinic?**

You can expect to be at the clinic between one and two hours. The dilating drops take approximately 20 minutes to take effect. The fluorescein angiogram takes about 15 to 20 minutes to complete. Your doctor will see the results when they are available.

#### **What does the test involve?**

The test begins with the photographer taking colour photographs of the retina with a digital camera. A small amount of fluorescein dye is then injected into a vein in your arm or the back of your hand. This is not painful. The dye travels quickly to the blood vessels of your eye. Over the next few

minutes the photographer takes a series of photographs that record the passage of the dye through the retinal blood vessels.

#### **Does the test cause any reactions?**

Most people suffer no ill effects from the test other than blurred vision for a few hours caused by the dilating drops and dazzle from the flash of the camera. A small number of people may experience nausea as the dye is injected. This quickly passes. A mild skin irritation may occur. There is a one-in-a-million risk of anaphylaxis (a major allergic reaction to the dye).

#### **Will the test cause any side effects?**

After the injection you may notice that the fluorescein dye has left your skin with a yellow tinge. This soon passes out of your body through your urine, which will appear orange the first few times you pass water following the test.



# 06.

## AMD treatment

### HOW IS DRY AMD TREATED?

Traditionally, dry AMD has been regarded as untreatable and our main aim was to concentrate on preventative measures, primarily tackling the risk factors for AMD. However, we are beginning to see exciting results with photobiomodulation (also known as red light therapy), and this is something which can be discussed at your appointment.



- Current smokers are strongly advised to stop.
- All patients should have their blood pressure checked regularly, and those considered 'borderline' should be treated.
- Good quality sunglasses should be worn in bright conditions, even in winter.

There is some evidence that dietary supplements may help to slow the progression of disease. This comes from the Age-related Eye Disease Study (often abbreviated to AREDS) which showed benefits with certain vitamins, minerals and pigments. Whether these supplements will be beneficial can depend on the number of factors including your current diet and the degree of

change at your macula. We will discuss with you whether or not a supplement is likely to help.

### HOW IS WET AMD TREATED?

Treatment for wet AMD has been revolutionised by the development and application of anti-VEGF injection therapies. It was in 2005 that the first injections were performed in the United Kingdom and that wet AMD was, for the first time, recognised as a treatable condition with a realistic prospect of visual improvement.

Before the development of injections such as Lucentis and Avastin, laser treatments had been attempted, but with limited success. Thermal lasers could be used to burn the abnormal blood vessels beneath the retina, but damage to surrounding tissue was



inevitable, and treatment was only really successful in those few cases where the point of leakage was away from the centre of the macula. A refinement in the form of 'cold laser' was attempted with treatments such as photodynamic therapy (PDT) and transpupillary thermo-therapy (TTT). Although effective in limiting the damage to healthy retina adjacent to the abnormal vessels, these techniques achieved only moderate success and have now been replaced almost completely by intravitreal injection.

Research has shown that the stimulus for growth of abnormal blood vessels is a protein produced by the ageing eye, which is known as vascular endothelial growth factor or, more conveniently, VEGF. We still do not

understand the many complexities of AMD, and cannot always say why the eye produces VEGF, but we are able to block the damaging effect of this growth factor with drugs such as Lucentis, Avastin and Eylea. These drugs are antibodies or similar molecules which effectively 'mop up' the damaging growth factor produced by the eye.

Anti-VEGF agents appear to prevent both the development of neovascularisation and fluid leakage from the abnormal blood vessels. Lucentis has been most extensively studied, with results

showing that visual loss can be halted in 90 per cent of cases and a substantial improvement in vision seen in about 30 per cent of cases.

Unfortunately, multiple injections may be required, and the long-term duration of treatment is, as yet, unknown.

Further information on these treatments can be found in our information booklet titled *Anti-VEGF Injection Treatments for Age-Related Macular Degeneration*.

## **COPING WITH AMD**

Although there may be no cure for your macular degeneration, many different strategies have now been applied and we will advise you on the best programme for your eye. Help and equipment are available to overcome some of the practical problems of daily living, such as reading and watching television. If you have not already been registered as sight-impaired, this may be something you wish to consider.

Registration will put you in touch with both social workers and local organisations experienced in the needs of the sight-impaired, who can help you develop practical ways to cope with your AMD. There are a number of low vision aids available, such as magnifying devices, improved lighting and coloured filters for spectacles.



## USEFUL CONTACTS FOR HELP & ADVICE

### Royal National Institute of Blind People (RNIB)

[www.nib.org.uk](http://www.nib.org.uk)

0303 123 9999

### Macular Disease Society

[www.macularsociety.org](http://www.macularsociety.org)

0300 3030111

### SAPPHIRE EYE CARE

1 Sleepy Hollow, Ampfield Hill,

Romsey, Hampshire SO51 9AW

[WWW.SAPPHIRE-EYECARE.CO.UK](http://WWW.SAPPHIRE-EYECARE.CO.UK)