CONDITION

Geographic atrophy

Geographic atrophy is an advanced form of dry age-related macular degeneration that gradually damages the macula and central vision.

WHAT IT IS
Advanced dry macular degeneration damaging the central retina

BODY SYSTEM
Eyes and vision

MAIN SYMPTOMS
Blurred central vision, missing spots, reading difficulty, poor night vision

WHAT CAUSES IT
Age-related damage involving genetic and environmental factors

HOW IT IS DIAGNOSED
Dilated retinal examination and retinal imaging

MAIN TREATMENT
Eye injections to slow growth, plus low-vision support

CAN IT BE CURED?
No - treatments only slow progression

IS IT AN EMERGENCY?
Sometimes - sudden vision loss needs urgent assessment

LONG-TERM OUTLOOK
Central vision often worsens while side vision remains

Overview

Geographic atrophy is an advanced form of dry age-related macular degeneration, often shortened to dry AMD. It affects the macula, the small central part of the retina that helps you read, recognize faces, drive, and see fine detail.

The retina is the light-sensitive tissue at the back of the eye. In geographic atrophy, areas of retinal cells gradually stop working and are lost. These areas often have clear, map-like borders, which is where the word "geographic" comes from.

Damage usually develops slowly. It may begin outside the very centre of your vision and cause few noticeable symptoms at first. As the affected areas grow or join together, central vision may become blurred or develop missing patches.

Geographic atrophy does not usually affect side, or peripheral, vision. It therefore does not normally cause total loss of all sight. However, central vision loss can have a major effect on reading, driving, cooking, identifying faces, and other daily activities.

Symptoms

Symptoms are usually painless and develop gradually. One eye may be more affected than the other, so the better-seeing eye can hide changes for some time.

You may notice:

Geographic atrophy does not normally cause eye pain, marked redness, or a sudden curtain across your vision. Those symptoms may have another cause and need prompt assessment.

Symptoms can also change when the affected area reaches the point used for your sharpest vision. A small change in location may then have a noticeable effect even if the total damaged area has not increased greatly.

- Blurred or hazy vision in the centre of your sight
- Blank, grey, or dark patches that do not move
- Needing brighter light for reading and close work
- Difficulty adjusting when moving from bright to dim light
- Trouble recognizing faces or seeing fine detail
- Colours appearing less bright
- Letters or parts of words disappearing while you read
- Straight lines appearing distorted, especially if wet AMD also develops

Causes and risk factors

Geographic atrophy results from a complex loss of retinal cells, including light-detecting cells and the supporting tissue beneath them. The immune system's complement pathway, which normally helps defend the body, appears to contribute to this damage when it becomes overactive in the retina.

There is no single cause. Age-related changes, inherited susceptibility, and environmental factors can all play a part.

Factors linked with a higher risk include:

Having one or more risk factors does not mean that you will develop geographic atrophy. People without a known family history can also develop it.

Geographic atrophy is different from wet, or neovascular, AMD. Wet AMD happens when abnormal blood vessels grow and leak under the retina. A person can have geographic atrophy and later develop wet AMD in the same or the other eye.

- Increasing age
- Existing age-related macular degeneration
- Smoking or past smoking
- A family history of macular degeneration
- Certain inherited genetic differences

Diagnosis

An eye care professional diagnoses geographic atrophy using an eye examination and detailed pictures of the retina. Your pupils are usually widened with drops so the back of each eye can be examined.

Tests may include:

If there are signs of leaking blood vessels, further imaging may be used to check for wet AMD. This matters because wet AMD needs different treatment.

Other conditions, including cataracts, glaucoma, inherited retinal conditions, and problems affecting the optic nerve, can also reduce vision. The examination helps identify which changes are due to geographic atrophy.

- Visual acuity testing: reading letters on a chart to measure central vision
- Dilated retinal examination: looking for pale areas of lost retinal tissue and other signs of AMD
- Optical coherence tomography: a painless scan, called OCT, that creates cross-sectional images of the retina
- Fundus autofluorescence: imaging that highlights stressed, healthy, and damaged retinal tissue
- Colour retinal photographs: pictures used to record the condition and compare changes over time

Treatment and management

There is currently no treatment that replaces retinal cells already lost to geographic atrophy. Management aims to slow further damage where possible, detect wet AMD promptly, and help you use your remaining vision.

In the United States, two medicines that block parts of the complement immune pathway have been approved for geographic atrophy caused by AMD: pegcetacoplan and avacincaptad pegol. They are given by injection into the eye at regular appointments.

Clinical trials found that these medicines slowed the average growth of atrophy. They did not restore lost vision, and the damaged area may continue to enlarge during treatment. The possible benefit can also take time to become clear.

Eye injections have risks. These include infection inside the eye, bleeding, increased eye pressure, retinal tears or detachment, and the development of wet AMD. Inflammation of retinal blood vessels has also been reported with pegcetacoplan. Your eye specialist can explain how the expected slowing of atrophy compares with the risks and appointment burden in your situation.

Treatment decisions may take account of:

If wet AMD develops, it is usually treated with injections that block vascular endothelial growth factor, or VEGF. These medicines treat leaking blood vessels; they do not directly treat the areas of geographic atrophy.

Low-vision rehabilitation can help at any stage. It may include magnifiers, electronic reading devices, brighter task lighting, high-contrast settings, text-to-speech software, and training in safer ways to complete daily activities. An occupational therapist or low-vision specialist can help match aids to the tasks that matter to you.

- The size and location of the damaged area
- How quickly it appears to be growing
- Vision in each eye
- Other retinal conditions
- Your health, priorities, and ability to attend repeated visits

Complications

The main complication is progressive loss of central vision. When both eyes are affected, reading, driving, managing medicines, preparing food, and recognizing people may become

harder.

Other possible complications include:

Charles Bonnet syndrome causes visual images that are not really present, such as patterns, people, or animals. It can happen when the brain receives less visual information. It is not, by itself, a sign of dementia or a mental health condition. Tell a healthcare professional if this happens so that other causes can be considered and support can be offered.

- Wet AMD, which can cause more rapid distortion or vision loss
- Falls or difficulty moving safely in unfamiliar or dim places
- Loss of eligibility to drive
- Reduced independence
- Anxiety, low mood, or social isolation
- Charles Bonnet syndrome

Prevention

Geographic atrophy cannot always be prevented. Age and inherited susceptibility cannot be changed, and there is no proven way to reverse retinal tissue that has already been lost.

Not smoking is one of the most important changeable steps for lowering the risk of AMD progression. If you smoke, support from a stop-smoking service, pharmacist, or healthcare professional may help.

A balanced diet that includes leafy green vegetables, fruit, fish, and other sources of nutrients supports general health. It should not be viewed as a cure for geographic atrophy.

AREDS2 vitamin and mineral supplements may be recommended for some people with particular stages of AMD. They are not suitable for every person or every stage, and they do not restore vision or cure geographic atrophy. Ask your eye care professional whether your retinal findings match the groups shown to benefit. Do not replace prescribed care with an ordinary multivitamin or an unverified "eye health" supplement.

Regular eye examinations cannot guarantee prevention, but they can identify AMD before major symptoms occur and help detect wet AMD promptly.

Living with it and what to expect

Geographic atrophy usually changes over months and years rather than days. The damaged

areas tend to enlarge, but the speed and effect on vision differ from person to person. Location matters: damage near the centre of the macula may affect reading more than a larger area farther from the centre.

Side vision usually remains useful. Many people continue living independently by changing lighting, using magnification, organizing their home, and learning to use accessibility features. Support is often more effective when started before vision becomes severely limited.

Regular follow-up commonly includes vision testing and retinal scans. These visits track growth, review whether treatment remains appropriate, and check for wet AMD or injection-related problems.

You may be asked to check each eye separately at home using an Amsler grid or another monitoring method. A new wavy line, distortion, or missing patch should be reported promptly rather than saved for the next routine appointment.

Driving ability is based on measured vision and local licensing rules, not the diagnosis alone. If driving becomes unsafe, mobility training and transport planning can help you remain active.

Vision loss can be emotionally difficult. Rehabilitation services, peer support, counselling, and practical help are reasonable parts of care, not signs that you have failed to cope.

When to get medical help

Arrange a routine eye appointment if you notice a gradual decline in reading vision, need much brighter light, or develop slowly growing blank areas. Also keep scheduled monitoring appointments even if your vision seems unchanged.

Seek urgent, same-day eye care for:

After an eye injection, get urgent help for increasing pain, marked redness, strong light sensitivity, discharge, or worsening vision. These can be signs of infection or another uncommon but serious injection complication.

Call emergency services for sudden vision loss accompanied by facial drooping, arm weakness, speech difficulty, severe dizziness, or another possible stroke symptom.

- A sudden new dark or blurred area
- New distortion or straight lines becoming wavy
- A rapid change in vision in either eye
- New flashes, many floaters, or a curtain-like shadow
- Sudden loss of part or all of your vision

Common questions

Is geographic atrophy the same as dry macular degeneration?

It is an advanced form of dry age-related macular degeneration. Earlier dry AMD may involve deposits called drusen and changes in retinal pigment without established areas of atrophy.

Will geographic atrophy make me completely blind?

It mainly damages central vision. Side vision is usually preserved, so complete darkness is not expected from geographic atrophy alone. Central vision loss can still be severe enough to meet legal definitions of blindness.

Can eye injections bring my vision back?

Current complement-inhibitor injections do not replace lost retinal cells or restore vision already lost. Their purpose is to slow the enlargement of atrophy.

How quickly does geographic atrophy progress?

It usually progresses over years, but growth rates differ. The effect on daily vision also depends on whether the damaged area reaches the centre of the macula.

Can I still drive with geographic atrophy?

Some people can drive during earlier stages. This depends on visual acuity, field of vision, symptoms, and local licensing standards. Stop driving and arrange an assessment if blank areas or poor detail make driving unsafe.

Is geographic atrophy inherited?

Genes can affect susceptibility, but geographic atrophy is not usually passed down in a simple, predictable pattern. Having an affected relative raises concern but does not mean you will definitely develop it.

Sources

- National Eye Institute. Age-Related Macular Degeneration
- National Eye Institute. AREDS and AREDS2 Clinical Trials
- US Food and Drug Administration. Drugs@FDA: Syfovre, pegcetacoplan injection, application 217171
- US Food and Drug Administration. Drugs@FDA: Izervay, avacincaptad pegol injection, application 217225

- Heier JS, Lad EM, Holz FG, et al. "Pegcetacoplan for the treatment of geographic atrophy secondary to age-related macular degeneration: OAKS and DERBY phase 3 trials." The Lancet . 2023;402:1434-1448.
- Khanani AM, Patel SS, Staurenghi G, et al. "Efficacy and safety of avacincaptad pegol in patients with geographic atrophy: 12-month results from the GATHER2 phase 3 trial." The Lancet . 2023;402:1449-1458.