STARGARDT DISEASE

Macular Disease Foundation AUSTRALIA

Stargardt disease is a rare inherited eye condition, which affects about one in 10,000 people. It is the most common childhood macular condition. It usually first appears between the ages of 10 and 20, although you may not experience visual problems until the age of 30 to 40.

Stargardt disease is caused by more than 1,000 different types of faults, or mutations, in a single gene. It is known by a variety of names: Stargardt dystrophy, Stargardt's macular degeneration, fundus flavimaculatus or juvenile macular dystrophy.

Stargardt disease causes parts of the macula to stop working, leading to problems with central vision, detailed vision and sometimes colour perception.

How the eye works

Your eye works very much like an old-style film camera. The front of your eye, made up of the cornea, iris, pupil and lens, focuses the image onto the retina, which lines the back of your eye. The retina is a light sensitive tissue that acts like the film in a camera, capturing images and then sending them via the optic nerve to the brain, where the images are interpreted.

What is the macula?

The macula is the name given to the area at the centre of the retina. It is only about 5.5mm in diameter and is responsible for detailed central vision and most of your colour vision. You use your macula to read, recognise faces, see colours clearly, and perform any other activity that requires detailed central vision.

Changes to the eye with Stargardt disease

In Stargardt disease, a waste product called lipofuscin slowly builds up in the retinal pigment epithelium (RPE), a special layer of the retina. The cells of the RPE normally clear away waste products like lipofuscin. However, in someone with Stargardt disease, the faulty gene gives incorrect instructions, which prevents the removal of these waste products. The waste products gradually build up, damaging the cells in the macula and sometimes in the rest of the retina.

There are two main findings in the retina of people with Stargardt disease. First, there is often an oval-shaped area, often referred to as 'beaten bronze' in appearance, around the macula. This area tends to deteriorate over time and causes changes in the way the cells of the macula work. This leads to a loss of visual acuity, meaning vision becomes less sharp.

The second change involves yellowish flecks in the retina. Sometimes people have just these flecks without the macular lesion. These people used to be diagnosed with fundus flavimaculatus. However, some researchers believe the macular lesion and the yellow flecks are both caused by the same gene and, therefore, are different versions of the same genetic problem.

Effect on vision

Stargardt disease usually only affects the macula, so central vision is impacted. At first, you may notice your central vision is unclear, and then sometimes distorted or blurred. As the disease progresses, a blank patch may appear in the centre of your vision.

Stargardt disease doesn't usually affect peripheral vision, although around 20% of Stargardt patients have subtype 3 disease, which involves the peripheral retina. Since we use our peripheral vision when we are moving around, most people with Stargardt disease can manage to move about on their own, albeit with some difficulty.

Stargardt disease can also cause problems such as glare and you may have difficulties adapting to changing light conditions.

Genetic cause of Stargardt disease

As mentioned above, Stargardt disease is caused by more than 1,000 different types of faults, or mutations, in a single gene. The first gene mutation responsible for Stargardt disease was discovered in 1997. Since then other gene mutations have been discovered that can cause the disease.

Genetic inheritance

Genes are the set of instructions on how our bodies should develop. We all inherit two sets of genes, one set from each of our parents, and we each pass on one of those sets of genes to our children. These sets of genes lie in pairs (one from each parent) and they determine our traits – the many things that make us individuals, such as hair or eye colour, or whether we get certain genetic conditions. There are two ways a trait can be passed through genes to children – by a dominant pattern or a recessive pattern.

Dominant and recessive traits

A dominant trait only needs to be inherited from one parent. With this type of inheritance, only one copy of the gene is needed. When a dominant gene from one parent is paired with a recessive gene from the other parent, the dominant gene switches on the trait. It is dominant over the other (recessive) gene inherited from the other parent and the child will have that dominant trait.

With recessive traits, two copies of the gene are needed, meaning both parents have to carry and pass on a copy of the recessive gene. When this happens, the recessive trait will be switched on and the child will have that recessive trait.

How Stargardt disease fits these patterns

Stargardt disease is usually inherited in an autosomal recessive pattern. This means that when two carriers of this faulty gene have a child, there is a one in four (25%) chance of the child having Stargardt disease. If an individual with Stargardt disease has a child with a partner who is a carrier, the child would have a one in two or 50% chance of having the disease.

The most common gene associated with Stargardt disease is called ABCA4. Recently, a rare dominant version of Stargardt disease has also been identified in the ELOVL4 gene. Genetic tests are available to determine which gene mutation is causing the disease.

Further information and genetic counselling is available from specialist clinics and your ophthalmologist will be able to advise you about local genetic services. People with Stargardt disease may also wish to be entered onto the Australian Inherited Retinal Disease Register and DNA Bank, located at Sir Charles Gairdner Hospital in Perth.

Diagnosis

Stargardt disease has characteristic changes in the macula that can be detected during an eye examination. Your eye health professional may use a number of tests to diagnose and characterise Stargardt disease, including fundus autofluorescence (FAF), optical coherence tomography (OCT), and sometimes fluorescein angiography (FA). Occasionally, an electroretinogram (ERG) may be performed to help in the early diagnosis of Stargardt disease in children.

Your ophthalmologist may also recommend genetic testing to confirm diagnosis early, inform prognosis and your eligibility for therapies and trials, and allow for low vision interventions, vocational and educational modifications and family planning.

Treatments for Stargardt disease

There is currently no treatment for Stargardt disease itself. In rare cases, new, leaky blood vessels can form under the retina, leading to sudden and significant vision loss. This is known as neovascularisation. Neovascularisation can be treated with the use of injections into the eye of an anti-VEGF drug, usually with considerable success.

Lifestyle changes

Researchers have reported that exposure to ultraviolet light may cause further retinal damage. Therefore, it is recommended that if you have Stargardt disease, you wear sunglasses with UV protection that conforms to Australian standards. A hat with a wide brim can also protect you from the sun's damaging ultraviolet rays.

Some reports have noted dimming of vision in Stargardt patients while smoking, so it is recommended you don't smoke.

The recommended eye-health diet is:

- eat fish two to three times a week, dark green leafy vegetables and fresh fruit daily, a handful of nuts a week, and limit your consumption of fats and oils
- choose low glycemic index (GI) carbohydrates instead of high GI whenever possible
- live a healthy lifestyle, control weight, and exercise regularly

In consultation with your doctor and eye health professional, a supplement containing lutein and zeaxanthin may also be considered.

There is no evidence that supplements based on the Age-Related Eye Disease Studies (AREDS and AREDS2), which are commonly recommended for age-related macular degeneration, are of any benefit for Stargardt disease.

Research has shown that supplements with excessive amounts of vitamin A should be avoided in Stargardt disease as gene mutations may lead to abnormal synthesis of the vitamin in the eye, resulting in increased loss of vision. So don't exceed the normal recommended dietary allowance of vitamin A.

Future developments

Significant research is taking place in this area, with several new drug candidates showing promise. In particular, several new gene therapy treatments are being developed, which will hopefully enable the insertion of the correct genes to negate the effect of the faulty genes.

In addition, a substantial amount of research is taking place with stem cell therapy. Human stem cell studies with Stargardt disease have recently commenced. It is hoped that stem cell treatment may ultimately be able to replace damaged retinal cells.

Managing vision loss

Although the long-term progression of the disease is variable, unfortunately most people with Stargardt disease eventually develop very poor vision. However, Stargardt disease doesn't cause total or black blindness.

A key priority with vision loss is maintaining quality of life and independence. A low vision assessment is an essential way to regain control of your situation and get started to ensure you can live well with reduced vision. These assessments include tests to determine how much of your vision remains. The result of these assessments will help you gain a better understanding of your vision impairment and how to make the most of your remaining sight. It will also include valuable advice and support for your individual circumstances.

You can undergo an assessment at a low vision clinic, and sometimes in a major hospital or university. Some eye health professionals also provide low vision assessments. You may be able to have an occupational therapy (OT) assessment in your own home to assess your visual safety and your needs. We recommend you contact MDFA so we can direct you to the appropriate low vision services for your needs.

Need more information?

You can also access our free, personalised support services and order information kits and Amsler grids by calling our National Helpline on **1800 111 709.**

MDFA has a free newsletter and you can sign up to receive invitations to education sessions and events in your area.

Macular Disease Foundation Australia is committed to reducing the incidence and impact of macular disease, by providing up-to-date information, advice and support.

Learn more about macular disease at **www.mdfoundation.com.au.**

How's your macula? Take the quiz at **www.CheckMyMacula.com.au.**

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