



CENTRE FOR
Eye Research
Australia

GET TO KNOW GLAUCOMA

The facts about glaucoma
and new discoveries on
the horizon

 cera.org.au

Understanding glaucoma

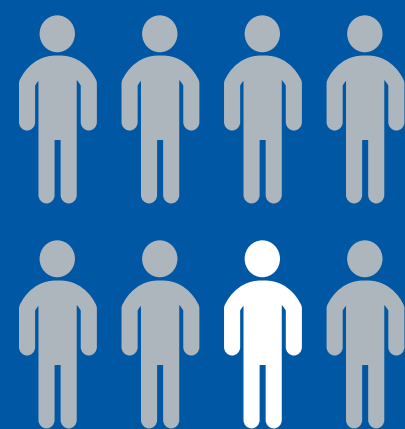
Glaucoma affects the optic nerve, which carries visual information from the eye to the brain. About 300,000 Australians have this eye disease.

The eye works a bit like a camera, capturing light and converting it to electrical signals. These signals are sent to the brain via the optic nerve, similar to a cable connecting a camera to a computer.

Glaucoma causes damage to the optic nerve. This can make it more difficult for images captured by the eye to reach the brain. If left untreated, it can lead to permanent vision loss and eventually, blindness.

The most common cause of glaucoma is too much fluid pressure inside the eye. This pressure builds over time and pushes against the optic nerve, causing injury.

This guide contains general information relating to glaucoma and is intended for informational purposes only. This information is not intended to be used as medical advice and does not guarantee any outcomes. Please do not use this information for diagnosing or self-treating any health or medical-related condition as this information is not a substitute for professional medical advice, diagnosis or treatment. If you think you may have a medical condition or emergency, please immediately consult a medical or health care professional for assistance.



Am I at risk?

Glaucoma can affect anyone, but the risk increases if you're aged 50 years or older. One in eight people over the age of 80 has glaucoma.

If you have a family history of glaucoma you're more likely to develop the disease. Your risk increases up to 10-fold if your parent or sibling has glaucoma.

Other factors that can increase your risk of glaucoma include:

- High eye pressure
- African or Asian descent
- High degree of long or short sightedness
- Serious eye injury
- Abnormally high or low blood pressure
- A prolonged course of steroid medication.

How do I know if I have glaucoma?

Glaucoma typically progresses slowly and you may not notice any symptoms until vision loss is advanced.

About half the people with glaucoma don't know they have the disease.

Regular eye checks are the only way to catch glaucoma early, before there is permanent damage to your sight.

If you're aged 50 or over, now's the time to book an eye test. However, if you have any risk factors for glaucoma – particularly a family history – you should start getting regular eye checks from age 40. You may need to begin even earlier if an immediate family member developed glaucoma before turning 40.

If you have painless, blurred vision, loss of peripheral vision, or difficulty adjusting to low light, it could be a sign of glaucoma. If you notice these symptoms, see your eye health provider – don't wait for your routine eye check.

A close-up photograph of an elderly person's eye. The iris is a deep green color with a cloudy, mottled appearance, which is a common sign of glaucoma. The surrounding skin is wrinkled and aged, with visible lines and creases. The eye is looking slightly to the left.

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Glaucoma treatments

Early treatment of glaucoma is key for preserving sight.

There is currently no cure for glaucoma, and once vision is lost it cannot be restored.

Fortunately, there are medical treatments that can help slow, or even stop, vision loss. The earlier you get treated, the more likely your sight can be saved.

Common treatments include eye drop medications, laser treatment and surgery. Patients may use one form of treatment, or a combination.

These treatments all aim to lower pressure in the eye. They either help eye fluid drain better or reduce the amount of fluid the eye makes. Reducing eye pressure can protect the optic nerve from further damage.



Eye drops.

Prescription eye drops are the most common treatment for glaucoma. There are several types, designed to suit different patients and forms of glaucoma.

To be effective, eye drops need to be taken daily and placed in the eye correctly.



Laser therapy.

Like eye drops, laser therapy is a common 'first line' treatment for glaucoma.

This involves shining short pulses of low-energy light into the eye.

The procedure itself usually only takes a few minutes, and is typically performed in an outpatient clinic.

The effect of laser therapy can last years. The procedure can be repeated once it wears off.



Surgery.

If eye drops or laser therapy are not effective, surgery is the next treatment option.

The most common surgical treatments are:

- Trabeculectomy – a small opening is made in the eye wall to drain excess fluid.
- Glaucoma drainage devices – small tubes are inserted into the eye to help fluid drainage.

Looking to the future

The world-class researchers at CERA are working to find better treatments for glaucoma – and potentially one day restore sight.

Advances in medical science have significantly improved outcomes for people with glaucoma. Yet, some form of vision loss – including blindness – is still a reality for many patients.

Despite the best available treatments, about 15% of glaucoma patients have vision loss that continues to get worse. This is why continued research into glaucoma is so important.

CERA researchers are among the world's top scientists investigating the causes of glaucoma and how it can be better treated.

Their goal is to not only prevent vision loss from glaucoma, but to potentially restore sight that has already been lost.

The next few pages provide a snapshot of some of the innovative glaucoma research happening at CERA.

These projects are bringing new hope – that for future generations, glaucoma may no longer be a threat to sight.



Regenerating the optic nerve

Ground-breaking research at CERA and the University of Cambridge is striving to regenerate the optic nerve after it has been damaged by glaucoma.

Current glaucoma treatments are largely aimed at lowering eye pressure to protect the optic nerve from further damage.

But an ambitious new project is striving to take a different approach – to strengthen and repair the optic nerve itself, potentially restoring some lost sight.

This research is led by CERA's Professor Keith Martin and the University of Cambridge's Professor James Fawcett, and is supported by funding from UK charity Fight for Sight.

Unlike some nerves in peripheral parts of the body, the optic nerve does not regenerate. The research team is trying to work out why – and what can help optic nerve cells to repair after damage.

Their early discoveries suggest that a molecule called protrudin may be an important part of the answer.

When the researchers increased protrudin or changed the way it works, it improved the 'transport system' within the eye's nerve fibres. This transport system is thought to help nerves repair, by getting essential molecules to the right place at the right time.

Regenerating the optic nerve was once seen as impossible. But with these early findings, it's now a realistic goal.

The ability to restore vision may still be a long way off but this new research brings hope of a life-changing treatment for people with glaucoma.



Professor
Keith Martin

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Glaucoma and vitamin B3

CERA has led a world-first clinical trial to find out whether a common vitamin supplement could help treat glaucoma.

Dr Flora Hui has been at the forefront of this ground-breaking research, which examined the impact of giving glaucoma patients a high dose of daily vitamin B3 in addition to their usual treatment. Results of the highly anticipated study will be released later in 2020.

Glaucoma leads to vision loss when cells in the retina and optic nerve are injured and stop functioning.

The study aims to show that vitamin B3 can protect nerve cells and support sick nerve cells to work better. This is different to current treatments like eye drops or surgery. These work to lower pressure rather than protect or repair cell damage.

Pre-clinical research in the US has shown that vitamin B3 can prevent optic nerve degeneration, but CERA is the first to trial this approach in humans with glaucoma.

A vitamin B3 treatment could potentially boost the ability of optic nerve cells to recover after injury and help retain visual function. This would be particularly significant for protecting the vision of older glaucoma patients as the ability to recover sight diminishes with age.

The study was initiated by CERA's former Managing Director Professor Jonathan Crowston and is continuing in partnership with him in his new role in Singapore. It is generously supported by the Ophthalmic Research Institute of Australia, Jack Brockhoff Foundation, Marian and EH Flack Trust, Jean Miller Foundation and Connie and Craig Kimberley Fund.



Dr Flora Hui

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Uncovering genetic risks

A genetic test to reveal your risk of developing glaucoma may soon be available, thanks to a new research collaboration.

Risk factors like age and family history have long been our best estimate of whether someone will develop glaucoma. But Australian researchers have now discovered a number of new genes that can more accurately predict individual glaucoma risk.

CERA's Professor Alex Hewitt was one of the lead researchers in the study, collaborating with a team of leading clinicians and scientists across Australia. The team was able to show, for the first time, that people with different genetic loads have different likelihoods of developing glaucoma.

The focus of the research was primary open angle glaucoma. This is the most common form of glaucoma in people of northern European descent. Interestingly, the researchers found that the test also worked well in people from South Asia.

They're now working to get the genetic test into clinics within the next two years.

Armed with a genetic test, clinicians will be able to categorise their patients as low, medium or high-risk of glaucoma and set a personalised screening plan.

As glaucoma often has no symptoms until there's advanced vision loss, people at high-risk will be encouraged to undergo frequent eye checks. This will increase the chance that glaucoma is detected and treated before permanent and irreversible vision loss occurs.

The study was published in the international journal *Nature Genetics* in early 2020.



All in the mitochondria

CERA researchers are investigating the role that defective mitochondria play in glaucoma.

A family history of glaucoma increases your risk of developing the disease. But new research is looking at a different genetic link for glaucoma – the role of genes in the cell's mitochondrial DNA.

Mitochondria are the tiny powerpacks that provide energy to our cells. They have a small but vital set of genes that are passed on from your mother. This makes them different from your other genes, which you inherit from both parents.

CERA researcher Associate Professor Ian Trounce is investigating how changes in this mitochondrial DNA

can lead to cell damage in the optic nerve and vision loss in glaucoma.

Current treatments for glaucoma aim to lower eye pressure but don't slow vision loss for many patients. There is mounting evidence that defective mitochondria play a role in glaucoma and his research will further investigate that link.

Associate Professor Trounce will work with Melbourne ophthalmologists to find glaucoma patients who can take part in his research later this year. After an initial study of 1000 people, a subset of around 5 percent of patients will be investigated further.

The four-year study aims to figure out if mitochondrial gene changes contribute to faulty mitochondria in patients with glaucoma. If it does, this may lead to new treatments for slowing vision loss that go beyond reducing eye pressure.

Associate Professor Trounce's research is supported by the National Health and Medical Research Council.





Be part of the future of glaucoma research

To advance our understanding of glaucoma and find better treatments, clinical research is essential – and the patients who participate play a vital role.

By taking part in clinical research, you can make a valuable contribution to the future of glaucoma treatment.

To express interest in future studies at CERA, you can join our clinical trials registry online. Provide as much information as you can, and our team will contact you if there's a study you might be suitable for.

Sign up at cera.org.au



HELP US ADVANCE GLAUCOMA RESEARCH

Our work would not be possible without the generosity of our supporters.

Help our world-leading researchers continue to improve the lives of people with glaucoma and other eye diseases.

By making a donation you are making a difference too. Thank you.

To make a donation, please visit **cera.org.au** or call us on **1300 737 757**.



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