Glaucoma Australia
Saving sight

Glaucoma News

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Our mission is to eliminate glaucoma blindness

The Research Issue

Written By Clinical Professor Ivan Goldberg and Dr Tanya Karaconji

The future for glaucoma detection and management looks bright.

Glaucoma globally affects more than 60 million people and blinds about 4.5 million of them, making this the most common cause of preventable blindness – with numbers set to rise as the population ages.

Insidious, chronic, and irreversible, most affected persons are unaware of their diagnosis, particularly in the early stages. Major ongoing challenges are to identify those with early disease accurately, as well as those at high risk of progressive damage, to monitor all glaucoma patients more effectively, and to tailor treatments individually.

Our understanding of the major modifiable risk factor in glaucoma – intraocular pressure (IOP) – has evolved with new extraocular (contact lens sensors) and intraocular (implantable IOP transducers) 24 hour IOP monitoring devices currently under investigation. Such technologies should add to the water-drinking provocative test to identify IOP fluctuations and spikes, which are otherwise missed.

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From the CEO

It's a delight to share with you that Glaucoma Australia has been able to provide education and support to more than 3500 people over the past 18months! Valuable support from our team of educators is now provided by post, phone, email, the internet and a range of social media channels. This progress is great news as it enables our sight saving information to be communicated further than ever before. We look forward to extending our reach and designing a way to measure our impact in the year ahead. These measures will ensure we stay patient focused and improve the quality of all our service provisions in the years ahead.

For those who were not able to join us at the World Glaucoma Congress, the patient symposium video is available to view (**www.bit.ly/WGCPatient**). Keynote presentations on current research, detection, treatment and management advances will inspire you. We were also reminded to keep encouraging our loved ones to get tested every two years from age 40 following the glaucoma risk screening.

Thanks to the generous bequests and donations received from our friends and supporters; Glaucoma Australia will open application for our 2019-2020 research grant program from 1 July - 1 September. We look forward to receiving applications from leading researchers who seek to improve the lives of people with glaucoma in a powerful way and I look forward to announcing the recipients on 10 October which is World Sight Day.

Thanks so much for your ongoing support.

Annie Gibbins

CEO

Cover Story

The Research Issue (continued)

Artificial intelligence algorithms already detect optic disc pathology; with large scale database pooling they show promise for screening and in virtual glaucoma clinics. Constant innovations in daily use devices such as smartphones, laptops, and electronic tablets, including the development of tablet-based perimetry, may enable high quality glaucoma care with telemedicine in remote and underprivileged communities.

These developments will also enhance home based management.

New classes of topical medications are becoming available with innovative mechanisms of action such as rho kinase inhibitors and nitric oxide donors. Drug delivery technologies promise sustained, slow release that will minimise patient non-adherence and surface side effects from many current topical treatments.

By identifying new pathological glaucoma pathways, genome-wide association studies may yield novel targets for preventative therapies.

Considerable developments in glaucoma management provide hope for improved visual preservation. We work in exciting times ●

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Feature

Glaucoma Management: The Next 15 Years

Written by Dr Guy D'Mellow

As a child I looked forward with excitement, to the promising advances that technology would bring. Video wrist watches, flying cars, commercial space travel, all seemed to be in close reach. The future appeared vast and only limited by what humankind could dream up. Lives were going to be drastically improved with labour saving devices, with fewer working hours and much more leisure time. Disease was just another of life's speed bumps that would be flattened out by technology. I just didn't think it would take so long!

The current gold standard in glaucoma surgery – trabeculectomy – was developed shortly before man landed on the moon and laser trabeculoplasty was first suggested around a decade later. With these as reference points, it would seem there has been little progress in glaucoma, however glaucoma knowledge, its epidemiology, pathogenesis, and treatments have vastly improved.

Just consider diagnostic elements. Visual field testing has evolved from a manual technique to a highly engineered, highly reproducible, machine based process, and optic disc assessment to exquisitely detailed imaging technology. Variables affecting intraocular pressure (IOP) measurement are much better understood, as is the potential effect of its fluctuation. Though still a major risk factor, IOP is no longer included in the definition of glaucoma.

Yet we are still a long way from the simple pill or procedure to cure glaucoma. It's clear that progress to a cure, together with flying cars, takes much longer than we would hope. So what can we realistically expect from the next 10–15 years in terms of our knowledge of, and ability to diagnose and manage, glaucoma?

Facing the issues

Some aspects of the future are clear. Firstly, in a technologically advancing world, vision has become increasingly important. Whether it be information gathering for day to day living, increased productivity in employment, or simply enjoying our leisure, vision based tasks are critical. Though voice recognition technology is improving, our smartphones, iPads, and personal computers all remain vision based.

Secondly, the world's population is aging. This is significant because across the globe glaucoma prevalence increases with age.

Reviews have suggested that prevalence of primary open angle glaucoma (POAG) roughly doubles each decade among populations of European descent and the increase is only slightly less in people of Asian descent. Estimates show that by 2020 there will be 65.5 million people globally with POAG.[1] Given that Asia has 60 per cent of the world's adult and aged population, and that low income countries within this region are predicted to experience rapid increases in life expectancy, the potential explosion in glaucoma cases is concerning. Total glaucoma numbers in Asia, (combining POAG, primary angle closure glaucoma, and secondary glaucoma) are projected to reach over 80 million by 2040.[2]

The effect of glaucomatous visual loss in an aged population is significant. As physical mobility declines, glaucoma is associated with an increased risk of falls, depression, decreased social contacts, and loss of independence through driving restriction. Clearly, preservation of vision is critical.

Future detection and diagnosis

Artificial Intelligence (AI)

In Australia, as in the rest of the world, there is a large undiagnosed population of glaucoma cases. Early detection and treatment offers the best hope for saving sight into old age, so over the next 10–15 years can we better detect these patients? Currently opportunistic screening of patients presenting for other causes, or selective screening of higher risk cases such as family members of glaucoma patients, are the employed techniques. To quote from Alan Turing, one of the pioneers of computer science "What we need is a machine that can learn from experience" to screen on a population basis. Though this quote is from 70 years ago, advances in applied AI may make this attainable in the next decade. Already computers use pattern recognition for identification purposes, e.g. retinal scans – why not extend this further?

AI processing may be of value in the future for both screening and in detecting progression in glaucoma. Since 2015, a number of studies have been published on the use of optic disc photographs to determine POAG from normal. Some of these have levels of sensitivity and specificity good enough to suggest potential use in clinical decision making. Further work using optical coherence tomography (OCT) imaging is likely to progress this further. It is not only glaucoma that may benefit from this technology. Similar work has been done with age related macular degeneration and diabetic retinopathy. The possibility of combining glaucoma, diabetic, and macula screening into a single test would revolutionise population based screening. There are limitations – such as ensuring adequate quality of images, the cost of acquisition, and the impact of the rate of false positives on referral pathways – but it is very exciting to contemplate.

The genetics of glaucoma

Another area that has potential impact on screening is the unfolding understanding of the genetics of glaucoma.

For POAG, genome wide association studies from large databases, such as the Australian and New Zealand Register of Advanced Glaucoma and the UK Biobank, have identified multiple loci associated with glaucoma. Though they are a heterogeneous group of genes involved, the field of genetics is progressing at a rate similar to that proposed by Moore's law[3] in computing, that is, a doubling of knowledge every 18 months. This, combined with dramatic decreases in the costs of genetic testing over the past decade, may lead to the very real prospect of genetic screening for glaucoma over the next 10–15 years.

Intraocular pressure (IOP)

Intraocular pressure (IOP) remains central to the management of glaucoma and its accurate measurement is very important. IOP fluctuation has been suggested to underlie progression of glaucoma in some patients but to date there has been no satisfactory means to measure IOP through the 24 hour cycle. Attempts via repeated clinic measurement or home self-tonometry can be unreliable in predicting fluctuation. Contact lens based telemetric IOP measurement has been available for a few years but cost, inconvenience and uncertainty of converting its output to a pressure unit have limited its uptake. An intraocular telemetric pressure sensor would be of great value, especially if it could be inserted in conjunction with commonly performed procedures such as cataract surgery. Such devices have been under investigation for the past two decades and appear to be inching closer to clinical use. A recent report on their long term safety in a small number of patients was positive. The question posed by the authors is pertinent: are they suitable for everyone and if not, which subset of patients is most likely to be advantaged by their use?

Treatment

The mainstay of medical treatment of glaucoma has been the use of one or more classes of topical medication. These agents either decrease aqueous production or increase aqueous outflow, thus effectively lowering IOP. Major advances in IOP lowering drugs occurred in the 1970s (beta blockers) and 1990s (prostaglandins), so we are overdue for a significant advance.

Drugs targeting the conventional aqueous outflow pathways of trabecular meshwork and Schlemms canal may be candidates for this over the next decade. Several possible classes have been under investigation in Phase II or III trials. Proof of their efficacy, safety, and tolerability would significantly broaden treatment options in the future.

I mentioned previously the substantial increase in the genetic background of glaucoma. The elucidation of these many genes and their functions within the eye allows targeting of some of these functions as therapeutic options. Recently there has been FDA approval of the first gene therapy to treat eye disease. Gene editing techniques may be applicable in the future in some specific glaucomas, such as Myocilin juvenile onset glaucoma or primary congenital glaucoma, where single genetic mutations exist. For the majority of glaucoma there is a heterogeneous aetiology. Here the focus is on gene therapies that enhance survival of retinal ganglion cells.

Adherence is a major issue in glaucoma. Topical medication may be difficult to manipulate,

cause tolerability problems due to ocular surface issues, and is inconvenient for patients. Alternative drug delivery systems should improve adherence problems and are likely over the next decade. These may be devices that allow slow sustained release of medication over several months.

Surgery

Surgical intervention in glaucoma is typically required when IOP is uncontrolled or there is progression of disease despite maximal medication with or without laser. The primary surgery for the past 50 years has been either trabeculectomy or tube shunt devices. These procedures are effective but complex and time consuming. They involve long recovery times and are subject to various complications. Over the past decade there has been an explosion in new glaucoma surgeries aiming to improve the above deficiencies.

Trans trabecular surgeries aim to decrease the resistance across the trabecular meshwork and inner wall of Schlemms canal, the major site of outflow obstruction. This is achieved by stenting devices (iStent/Hydrus)/ (Figure 1) or modified trabeculotomy (Trabectome).

Draining aqueous internally has also been developed, but safety concerns with one of these devices (Cypass) has recently lead to its recall.

Simplifying the process of external drainage of aqueous is the aim of the new Xen and InFocus drainage devices.

While these new interventions have shown benefits of varying degrees in clinical trials, questions regarding their long term efficacy and their place in glaucoma management will certainly become much clearer over the next 10 years. Do they have the potential to replace medication? Is a particular intervention better for a certain type of glaucoma? Do combinations of these surgeries work better together? Time will give us the answers to most of these questions.

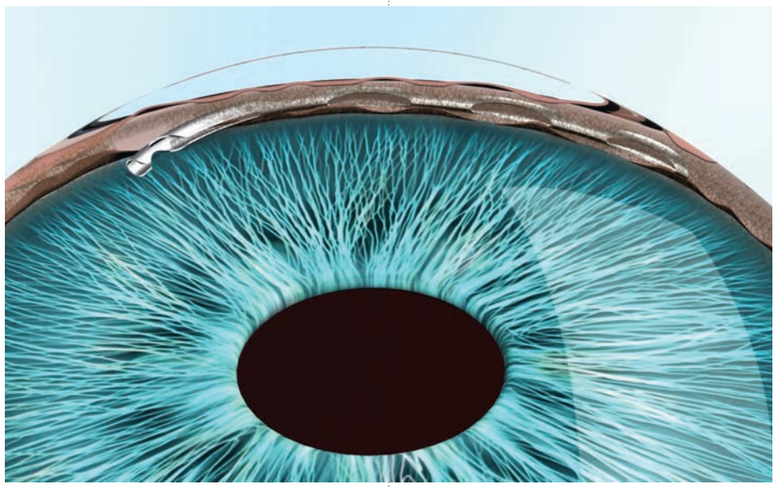

Figure 1 : iStent/Hydrus

A promising future

The next 10-15 years will see continued progress on many fronts in the fight against glaucoma blindness. Artificial intelligence may revolutionise screening and decision making in glaucoma care. Genetic therapies may provide real neuroprotection options, and medical and surgical treatments will continue to improve. The holy grail of regenerating the optic nerve however may lie beyond the 10 year horizon. The future in glaucoma is full of promise let's hope it gets here soon ●

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References available glaucoma.org.au

The Genetics of Glaucoma

Written by Professor David A Mackey, Professor Jamie E Craig, Professor Alex W Hewitt, and Associate Professor Stuart Macgregor

Over the last 25 years we have changed our thinking about glaucoma – whereas once it was considered to be a degenerative disease of aging, we now view glaucoma as a complex genetic disease. Consequentially, this has changed our screening and management process.

Family history now plays a key part in identifying high risk individuals, and genetic testing is rapidly broadening as new genes are discovered. With over 100 genes that cause glaucoma or raise intraocular pressure (IOP) identified, we hope to soon have a genetic test for people who have a family history of glaucoma, and eventually for the entire population.

Glaucoma is one of the most heritable common diseases. Indeed, two very large studies in the United States, using health insurance and claims data, have shown glaucoma to be one of the most heritable of all types of diseases.[1,2] Studies such as the UK Biobank have identified over 100 genes for Mendelian and complex forms of glaucoma.[3,4,5] In Australia, with the support of Glaucoma Australia, researchers have been undertaking studies on glaucoma genetics since the discovery of the GLC1A gene in 1993.

Glaucoma Australia has supported the Glaucoma Inheritance Study in Tasmania (GIST) since its early days in 1994 by providing funding, recruiting glaucoma patients for the study, and by developing clinic posters.

The population of Tasmania is ideal for genetic research because of its good genealogy records due to a founder effect (where many people are descended from early immigrants to the island) and lower levels of recent immigration compared to the rest of Australia. In the 1940s, National Health and Medical Research Council (NHMRC) funded research into genetic eye disease in Tasmania revealed large pedigrees with other hereditary eye diseases, due to hundreds of carriers who descended from a single immigrant in the convict era.[6] At that time, few glaucoma pedigrees were identified because most cases were undiagnosed until people went blind from the disease. Additionally, few patients informed their relatives they were being treated for glaucoma.

The genetic research undertaken in Tasmania has been invaluable to building our knowledge of the genes associated with glaucoma. The GIST study was completed with the cooperation of all

Tasmanian ophthalmologists, many local optometrists, general practitioners, and pharmacists who enrolled in glaucoma cases, determined ancestry, and used Tasmanian genealogical records to connect glaucoma patients into pedigrees. Between 1994 and 1999, nearly 2,000 cases and 3,000 relatives were examined.

This important study helped identify the Myocilin gene and severity of the disease, which varied with different mutations (phenotype-genotype correlations).[7]

It also found that over 40 per cent of people have a first degree relative (parent, brother or sister) affected by glaucoma.[8]

Importantly, GIST showed at that time, over a quarter of people were unaware of their family history of glaucoma – even those with a strong family history.[9] Additional glaucoma genes[10] were identified by the Australian and New Zealand Registry of Advanced Glaucoma (ANZRAG – www. ANZRAG.com),[11] using genome-wide association studies (GWAS).

Family history data from the GIST helped inform the National Health and Medical Research Council (NHMRC) guidelines for Screening, Prognosis, Diagnosis, Management and Prevention of Glaucoma. These guidelines included recommendations for screening high risk individuals

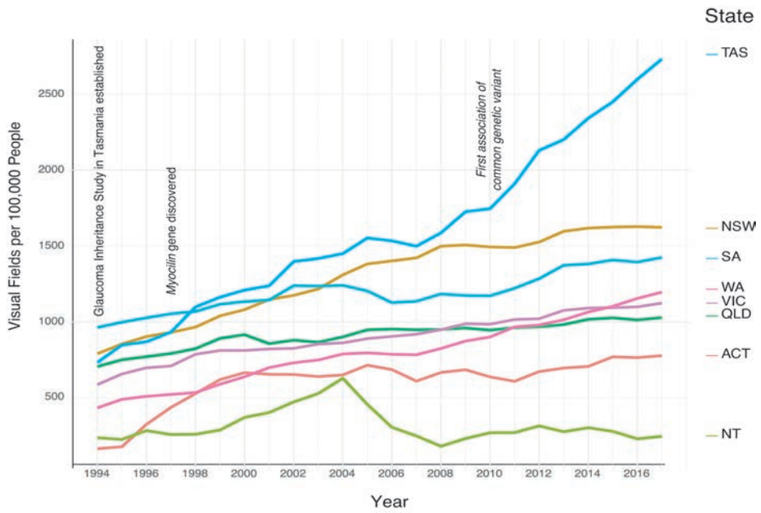

Figure 1

such as first degree relatives (siblings and children) of glaucoma patients, who are at 10 times greater risk of glaucoma than the general population.[12]

Awareness increases screening

Medicare data available from 1994 through 2018 for visual field testing, which is most often performed to test for glaucoma, shows that GIST research and the NHMRC guidelines developed as a result of its findings, have significantly impacted glaucoma screening in Tasmania.

Data shows a quadrupling in the number of visual field tests conducted in Tasmania (from 733 services per 100,000 population to 2,732 per 100,000 population) compared with only a doubling nationally (Figure 1)[6].

Part of this increase in Tasmania was due to the aging population, with the island state experiencing the largest increase in median age. However, even adjusting for the increased number of Tasmanians over the age of 40, there was still a large increase in the number of visual field tests conducted. This was likely due to the enhanced awareness of the need for screening among the thousands of at-risk members of the glaucoma families in Tasmania and their health providers. The next highest rates of visual field testing are in New South Wales and South Australia, which have the highest enrolments in the ANZRAG. With this evidence in mind, health professionals should encourage glaucoma patients to inform their family members to seek clinical screening. ●

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References available glaucoma.org.au

Celebrating our Amazing Volunteers!

During May (20–26th) we celebrated National Volunteer Week, this annual celebration acknowledged the generous contribution of our nation's volunteers.

Volunteering Australia announced the theme for National Volunteer Week this year was *"Making a world of difference"*.

To celebrate Glaucoma Australia hosted a morning tea which was only one of thousands of events held across the country to say thank you to the 6 million Australians who volunteer their time.

Our volunteers enjoyed a cuppa and a selection of scrumptious cakes. One of our long time volunteers, Tony spoke how much he enjoys lending a helping hand.

At Glaucoma Australia we are so grateful to our AMAZING volunteers who make a world of difference to people living with glaucoma!

"We couldn't do this without you. You might not think you do a lot, but your contribution to Glaucoma Australia is huge. Without you we simply couldn't do what we have set out to do to improve the lives of people with glaucoma" said Glaucoma Australia CEO, Annie Gibbins.

If you'd like to volunteer your time.
Please call (02) 9411 7722 or
email glaucoma@glaucoma.org.au. ●

Vernon's Story

To all pig headed people (like me).

I was diagnosed with glaucoma 9 years ago, when I was 53 years old.

I went to an optometrist when I realised I needed reading glasses. The optometrist insisted that I have a pressure test on my eyes. He then pointed out that the pressure in my eyes was too high.

He noticed that I just wanted my glasses, and I, being 'Dr Google', thought that glaucoma was an old person's problem. With this, he decided to speak to my wife, who was waiting outside the shop. Both made sure I followed up my eye appointment by seeing a specialist.

To say I was shocked at 53 to be diagnosed with glaucoma is an understatement!

Luckily I have little eye damage. I regularly visit my eye specialist and have daily eye drops.

I would love to catch up with the optometrist who first sent me to the eye specialist. This man saved my sight!

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Many thanks to the companies, clubs and organisations who provided financial and other support to Glaucoma Australia:

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In Memorium

We acknowledge with gratitude gifts, from family and friends, in loving memory of Manuel Xenikakis.

Bequests

The estate of the Late Sybil Dawne Hintze

The estate of the Late Mary Garroway

The estate of the Late Patricia Gallagher

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A gift in your will can help eliminate glaucoma blindness.

If you would like more information about leaving a gift in your will please contact Glaucoma Australia on 02 9411 7722 or email ceo@glaucoma.org.au

How can we help?

Glaucoma Australia offers FREE education and support to people living with glaucoma.

If you or someone you care for has been diagnosed with glaucoma we recommend you join our community to access free resources, guidance and support.

Join our community online

www.glaucoma.org.au/registration

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Q&A Selective Laser Trabeculoplasty

Written by Dr Simon Phipps

Q ***Why do some doctors start treatment with eye drops and others with Selective Laser Trabeculoplasty (SLT)? How do I decide the best option for me?***

A Studies have shown eye drops or SLT can be effective in lowering eye pressure in the treatment of glaucoma. However a doctor may prefer initial treatment with drops or SLT based on factors such as patient lifestyle, pre-existing eye problems or disease, type of glaucoma, the severity of glaucoma and initial untreated intraocular pressure. In some instances the eye specialist may recommend both treatments (eye drops and SLT) be started simultaneously. Discussing these two treatment options with your doctor will help you decide which one to choose.

Q ***Can SLT laser harm my eyes?***

A SLT is generally a very safe treatment. The risk of permanent harm to the eye is extremely rare or possibly even non-existent. There maybe a very rare risk of the eye pressure rising for a prolonged period after SLT in patients with pigmentary glaucoma. If this occurs surgery maybe required to lower the eye pressure. Significant but rare and reversible complications from SLT which can reduce vision for a time but not permanently include inflammation of the eye, bleeding into the front of the eye, swelling of the retina and clouding of the cornea. With time these complications resolve and vision returns to normal. Occasionally glasses may need to be adjusted to bring vision back to normal.

Q ***I am scared to have the laser treatment done. Is it painful?***

A Thankfully SLT is generally not a painful procedure. Many patients report "feeling" the procedure as it is occurring but wouldn't describe it as painful. In the rare instance that it does feel painful the doctor can help by reducing the power of the laser treatment during the treatment process.

Q ***What symptoms are considered normal after the SLT laser? Is it normal for my eyes to feel gritty and look red?***

A Sensitivity to light, blurry vision, eye redness and a gritty sensation are all normal after SLT treatment. These symptoms are usually mild and resolve over 2-3 days.

Q ***Can I use lubricating eye drops to help with post laser symptoms such as irritated and dry eyes?***

A Yes. Lubricating eye drops can often help the eyes feel more comfortable after treatment.

Q ***My friend had some eye drops to use for a few days after the laser - some antibiotics and anti inflammatory. But my doctor did not recommend any eye drops post laser. Why would that be the case?***

A Many doctors don't routinely prescribe eye drops after SLT laser. However there may be instances related to a patients previous eye history or health or lifestyle demands where use of eye drops after SLT is recommended by the doctor. Generally the eye drops would only need to be used for one week after SLT.

Q ***Can I have SLT laser in both eyes on the same day?***

A Yes. In fact most doctors will routinely treat both eyes with SLT on the same day.

Q ***How often or how many times can SLT laser be repeated?***

A SLT can be repeated indefinitely every 12 to 24 months. The treatment interval maybe more frequent initially if the doctor treats only one half or 50% of the eye. In this situation the other half of the eye(s) maybe treated only a few weeks later. Treatment intervals will vary depending on patient eye pressure and whether the glaucoma is stable. SLT can be effective for up to 5 years in some patients without need for more treatment. ●