# RANZCO 51st Annual Scientific Congress
# Conference Review™

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## In this review:



**Abbreviations used in this review:**

**ABS** = Australian Bureau of Statistics; **AI** = artificial intelligence; **AMD** = age-related macular degeneration; **BCVA** = best corrected visual acuity; **CI** = confidence interval; **CMT** = central macular thickness; **CNV** = choroidal neovascular; **DME** = Diabetic Macular Oedema; **DR** = diabetic retinopathy; **FDA** = Food and Drug Administration; **GWAS** = genome-wide association studies; **HTG** = high tension glaucoma; **IOL** = intraocular lens; **IOP** = intraocular pressure; **MIGS** = minimally invasive glaucoma surgery; **nAMD** = neovascular age-related macular degeneration; **NTG** = normal tension glaucoma; **OCT** = optical coherence tomography; **OR** = odds ratio; **PRS** = polygenic risk score; **RANZCO** = Royal Australian and New Zealand College of Ophthalmologists; **ROP** = retinopathy of prematurity; **SLT** = selective laser trabeculoplasty; **SNP** = single-nucleotide polymorphism; **VA** = visual acuity; **VCDR** = vertical cup to disc ratio; **VF** = visual field.



# Welcome to this review of the 51st Royal Australian and New Zealand College of Ophthalmologists (RANZCO) Congress.

This year marks 50 years of the College of Ophthalmologists in Australia. As such, the congress reflected on the past and also focussed on the future. The meeting provided an opportunity for International, Australian and New Zealand ophthalmologists, trainees and allied health eyecare professionals to share the latest clinical, scientific, research and practice developments in eye care.

Selection and review of the research has been carried out independently by Associate Professor Tim Roberts, Clinical Associate Professor of Ophthalmology at The University of Sydney and Consultant Ophthalmic Surgeon at the Royal North Shore Hospital, who attended RANZCO 2019.

The meeting abstracts can be viewed online at http://www.ranzco2019.com/wp-content/uploads/2019/11/RANZCO-2019-Abstract-Handbook-1.pdf.

We hope you enjoy this Conference Review, and we invite you to send any comments or feedback.


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## Artificial intelligence and deep learning: Panacea or existential threat?

### Artificial intelligence in ophthalmology: Concepts, progress, challenges and myths

**Presenter:** Wong T

**Summary:** Artificial intelligence (AI) has potential applications in healthcare, including in the screening and diagnosis of major eye diseases such as diabetic retinopathy (DR), age-related macular degeneration (AMD) and glaucoma, and in the analysis and interpretation of retinal photographs, OCT scans and clinical data. Deep learning, a subset of AI, uses large datasets and convoluted neural networks to mine, extract and learn patterns and features of a disease. These techniques have shown high sensitivity and specificity in detecting referable DR from retinal photographs, with FDA approval granted for DR screening. To be useful in the clinic, AI needs to be validated in real-world clinical settings, where datasets and images have varying qualities, and in patient populations of different characteristics and ethnicity. Challenges and limitations of the technology exist and understanding and navigating these will be critical in order for the effective use of AI in ophthalmology.

***Reference: Clin Experiment Ophthalmol. 2019;47(Supp 1;L02)***

### Development of a deep learning algorithm for automated diagnosis of retinopathy of prematurity plus disease

**Presenter:** Tan X

**Summary:** Blindness from retinopathy of prematurity (ROP) can be prevented with early detection and treatment. The use of AI may help to automatically diagnose plus disease in fundal images. Images (N=6974) from Australasian databases were manually classified as nil plus or plus disease and used to train and validate a screening algorithm. The algorithm initially achieved 96.6% sensitivity, 98.0% specificity, and 97.3% accuracy. Following optimisation, the algorithm achieved 97.0% sensitivity and 97.8% negative predictive value. The study demonstrates that it is possible to use AI and deep learning to diagnose plus disease with high sensitivity, which may allow for novel models of screening and care in the future.

***Reference: Clin Experiment Ophthalmol. 2019;47(Supp 1;P0401)***

### Artificial intelligence will replace ophthalmologists in the future: Fact or fiction?

**Symposium Chair:** Verma N

**Summary:** RANZCO has been following the emergence of AI and associated technologies with great interest and has an expert group that assesses its impact in the management of eye diseases. Given several diagnostic systems have FDA approval, there is concern that AI-powered devices will replace medical and allied health professionals. AI does have issues and challenges, particularly with respect to the use of large datasets. Potential issues may be related to data quality, standards, privacy, data ownership, safety, cost and medico-legal aspects. The symposium generated conversation, debate and reflection on the role of AI in future clinical practice.

***Reference: Clin Experiment Ophthalmol. 2019;47(Supp 1;S28)***

## Automating glaucoma diagnosis through convolutional neural networks

**Presenter:** Marks S

**Summary:** The burden of glaucoma is large, with 65 million people worldwide expected to have the condition in 2020. Because of the large number of patients, an alternative to ophthalmologist-based diagnosis of glaucoma is needed. An AI-based system for the diagnosis of glaucoma has been developed using deep learning and an open-source convolutional neural network. This method has >79% accuracy, which is similar to the accuracy of ophthalmologist-based diagnosis (83%).

***Reference: Clin Experiment Ophthalmol. 2019;47(Supp 1;S0511)***

**Expert Comment:** Artificial Intelligence was discussed at this year's meeting and was the topic of Prof Tien Wong's Norman McAlister Gregg Lecture. AI is a key driver of the so-called "Fourth Industrial Revolution", a term coined by Klaus Schwab at the 2016 Davos World Economic Forum. Simply put, it refers to how technologies like AI, deep learning, autonomous vehicles and the internet are merging with humans' physical lives, changing the way we live, work and interact. AI holds the promise of solving some of society's most pressing health issues, but also presents some important challenges. Technical and non-technical issues such as the quality and quantity of input data, inscrutable deep learning "black box" algorithms, the unethical use of data, the concentration of AI technology in the hands of a few, and mistrust by doctors and the public, have resulted in growing pains with some commentators questioning whether AI may actually pose an "existential threat to humanity". Unlike traditional programs using "pattern recognition" to detect specific patterns (e.g. microaneurysms and hard exudates in DR), deep learning uses much larger datasets and convoluted neural networks (CNN or "black box"). Understanding the decision-making algorithm of the "black box" is too difficult for most to understand, which in turn leads to anxiety and a feeling of losing control. As AI becomes more common for screening, diagnosing and helping treat eye conditions, RANZCO and other professional bodies are assessing its impact in the management of eye diseases and the profession, and developing guidelines for use. Despite some of the significant issues facing AI in the ophthalmology space, it does offer opportunities to improve accuracy and increase the cost-effectiveness of delivering care, especially in countries and areas with limited resources and medical training and for certain in narrow, specific tasks, such as DR screening. As Prof Wong concluded, AI is nearing the "peak of inflated expectations" seen with the introduction of all new disruptive technologies, and the next stage in development needs to address data quality, medico-legal and regulatory controls and guidelines, and any technical and non-technical issues limiting physician confidence.

# Big Data Registries

## The fight glaucoma blindness! registry: Design, baseline characteristics and early outcomes of combined cataract surgery with iStent inject

**Presenter:** Lawlor M

**Summary:** Fight Glaucoma Blindness! is a web-based glaucoma registry that collects real world outcomes of patients undergoing glaucoma surgery enabling clinicians to compare their glaucoma surgical outcomes with those of their peers. There are currently 502 patients in the registry who have undergone combined cataract with iStent G2 procedures, of which 280 eyes of 20 surgeons have completed at least 6 months of follow up. At 6 months, mean IOP was 12.9 mmHg (22% reduction from baseline) with a mean number of 0.7 topical antihypertensive agents (53% reduction from baseline). Complications included choroidal effusions in 3 patients, hyphaemia in 1 patient and secondary glaucoma surgery in 1 patient.

***Reference: Clin Experiment Ophthalmol. 2019;47(Supp 1;S0501)***



## 3 years real-world treatment outcomes of ranibizumab vs aflibercept for neovascular age-related macular degeneration: Data from the fight retinal blindness! registry

**Presenter:** Bhandari S

**Summary:** Ranibizumab and aflibercept are both indicated for treatment of neovascular AMD (nAMD). In this study, 3-year treatment outcomes of ranibizumab and aflibercept were evaluated in patients treated in routine clinical practice. Treatment-naïve eyes (N=965) starting either ranibizumab or aflibercept for nAMD in the Fight Retinal Blindness! Registry were identified. At the start of treatment, the mean VA and the type of the choroidal neovascular (CNV) lesion were similar in the two groups; ranibizumab-treatment was more common in older patients. The crude mean VA change in ranibizumab patients from baseline to 3 years was +1.5 letters (95% CI, 0-3.1) and in aflibercept patients was +1.6 letters (95% CI, −0.2-3.3). The difference between groups at 3 years was not significant (P = 0.97). There was also no difference in treatment frequency or discontinuations and there were more switches from ranibizumab to aflibercept (p <0.001) than *vice versa*.

***Reference: Clin Experiment Ophthalmol. 2019;47(Supp 1;S3006)***

## Minimally invasive glaucoma surgery (MIGS) as a standalone procedure for glaucoma in Australia and New Zealand

**Presenter:** Hall E

**Summary:** This study aimed to determine if standalone MIGS treatment is at least as efficacious as combined cataract-MIGS surgery using data from the Save Sight Fight Glaucoma Blindness Registry, the Ivantis Worldwide Hydrus registry, and from surgical centres in Australia and New Zealand. Preliminary data showed an effective reduction in IOP and medication use for patients treated with standalone MIGS. Data from the Hydrus registry (N = 295) showed a 30% IOP reduction and 38% medication reduction compared to baseline. The authors suggest that funding and accessibility of MIGS surgery should not be dependent on the patient's lens status.

***Reference: Clin Experiment Ophthalmol. 2019;47(Supp 1;S0507)***

## The long-term outcomes from corneal cross-linking: A Save Sight keratoconus registry study

**Presenter:** Watson S

**Summary:** Five-year outcomes of 113 eyes that underwent corneal cross-linking for keratoconus were analysed in patients prospectively enrolled in the Save Sight Keratoconus Registry. After 5 years the mean change in VA was 5.7 letters (95% CI, 2.6 to 8.7; P<0.001), change in $K_{max}$ was −0.6 D (95% CI, −1.8 to 0.6; P=0.304) and change in pachymetry was −8.3 microns (95% CI, −14.3 to −2.3; P=0.007). Visual acuity at the index visit was the strongest predictor for 5-year outcomes. Adverse events included clinically significant haze, microbial keratitis, persistent epithelial defect, recurrent corneal erosion, scarring and sterile infiltrates.

***Reference: Clin Experiment Ophthalmol. 2019;47(Supp 1;S1005)***

## Cognitive assessment in normal-tension and high-tension glaucoma

**Presenter:** Mullany S

**Summary:** This study compared the prevalence of cognitive impairment in normal-tension glaucoma (NTG; n=142) and high-tension glaucoma (HTG; n=148) patients within the Australian and New Zealand Registry of Advanced Glaucoma registry. Cognitive screening was performed and analysed using logistic regression analyses with adjustments for advancing age. An association was observed between NTG and cognitive impairment (OR = 2.9; 95% CI, 1.3-6.9; P = 0.013) which remained after adjustment for age (OR = 2.8; 95% CI, 1.2-6.7; P =0.022). These results suggest that NTG could partly represent an ocular manifestation of global neurodegenerative disease and may share patho-aetiological features with conditions such as Alzheimer's Disease.

***Reference: Clin Experiment Ophthalmol. 2019;47(Supp 1;P0402)***

## Multitrait analysis of glaucoma, intraocular pressure and vertical cup to disc ratio identifies many new loci and enables a polygenic genetic risk score strongly predictive of disease susceptibility in the population, and disease progression and treatment intensity in the clinic

**Presenter:** Craig J

**Summary:** The aim of the study was to generate an effective polygenic risk score (PRS) to predict glaucoma in the population, and to predict progression and treatment in the clinic. Data from the UK Biobank related to GWAS, VCDR, and IOP were used to construct a glaucoma-associated set of 2673 SNPs. The SNPs were evaluated for disease prediction and clinical covariates in independent case-control studies, and in the prospective PROGRESSA study. Multivariate modelling identified 107 glaucoma loci (49 novel), with high concordance in independent glaucoma cohorts. In advanced glaucoma, the risk was 15-fold greater in the top vs bottom decile of PRS. The PRS predicted surgical intervention in advanced disease and was associated with escalating intensity of medical therapy and disease progression in early glaucoma. Glaucoma PRS profiling may therefore enable earlier screening and treatment for high-risk individuals, with reduced screening and monitoring for lower-risk individuals.

***Reference: Clin Experiment Ophthalmol. 2019;47(Supp 1;P0404)***

**Expert Comment:** The rapid expansion of electronic health systems has seen the establishment of many global and national "big data" registries utilising large population-based health administrative databases, clinical registries and data linkage systems. Data were presented from Save Sight Fight Glaucoma Blindness, Fight Retinal Blindness and Keratoconus Registry, UK Biobank, Australian and New Zealand Registry of Advanced Glaucoma (ANZRAG) and the International Glaucoma Genetics Consortium. Different registries around the world offer clinicians the opportunity to track their performance on key quality metrics and provide researchers the opportunity to study quality of care and patient outcomes. As these registries grow, future benefits will include opportunities to study important topics such as the epidemiology of different ocular diseases, disparities in eye care, geographic variation in care, quality of care and patient outcomes.

# Diabetic Maculopathy & Cataract Surgery

## Epidemiology of diabetic retinopathy and maculopathy in Auckland, New Zealand: A regional photo-screening program 2006-2018

**Presenter:** Hill S

**Summary:** This study examined the incidence, severity, and progression of diabetic retinopathy in 63,625 people with Type 1 and Type 2 diabetes based on the retinopathy and maculopathy grades from photo-screening examinations. The mean age of the cohort was 59 years, 52% of patients were male and 81% of patients had Type 2 diabetes. At the first photo-screening presentation, 42,235 patients did not have any diabetic retinopathy, 45,413 patients had no diabetic maculopathy, 19,667 patients had non proliferative diabetic retinopathy and 15,515 had no sight threatening maculopathy. Only 2.7% of patients presented with proliferative diabetic retinopathy and 4.2% with potential sight threatening maculopathy. Progression to sight threating retinopathy over five years was rare (<5%).

***Reference: Clin Experiment Ophthalmol. 2019;47(Supp 1;S2010)***

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**Independent commentary by Associate Professor Tim Roberts** MBBS, MMed, FRANZCO, FRACS

Tim Roberts is Clinical Associate Professor of Ophthalmology at The University of Sydney and Consultant Ophthalmic Surgeon at the Royal North Shore Hospital.

A/Prof. Roberts specializes in cataract surgery and glaucoma, with research interests in new generation formulas for calculating IOL power; the application of femtosecond lasers in cataract surgery; presbyopia-correcting IOLs; digital imaging systems and toric lenses in astigmatism management; complex cataract surgery and ocular trauma repair; MIGS (minimally invasive glaucoma surgery); fixed-combination and slow-release glaucoma therapies; and medical ethics and education. He has published over 55 peer-reviewed journal articles, book chapters and editorials, and continues to present his research locally and internationally.

A/Prof. Roberts serves on the editorial board for the American Academy of Ophthalmology Lens and Cataract textbook, and as Cataract Section Editor for Clinical & Experimental Ophthalmology and the Asia-Pacific Journal of Ophthalmology. He sits on various government, industry, and professional advisory boards and has worked with local and international indigenous Eye Care programs. He has been supervisor of ophthalmology trainees for RANZCO Board of Examiners and currently serves as academic coordinator for The University of Sydney Northern School of Medical.

## Twelve-month results of the DIMECAT trial: A prospective, randomised clinical trial of intravitreous bevacizumab vs triamcinolone in patients with diabetic macular oedema at the time of cataract surgery

**Presenter:** Lim L

**Summary:** A prospective, single-masked, randomised study in eyes with cataract and centre-involving diabetic macular oedema (DME) or previously treated DME. Eyes were randomised 1:1 to bevacizumab 1.25 mg or triamcinolone 4 mg during cataract surgery and as required over 12 months. At baseline, BCVA and CMT were similar between the treatment groups, and remained so in the 40 eyes (20 per treatment group) that reached 12 months of follow-up (P >0.05). Compared to baseline, vision improved for both treatments (bevacizumab +16 letters vs triamcinolone +18 letters; P=0.90). Triamcinolone was associated with a sustained reduction in CMT from baseline compared to bevacizumab (–46 µm vs +7 µm; P = 0.015). Two-thirds of triamcinolone-treated patients avoided further re-treatments post-operatively, compared to 39% of bevacizumab-treated patients (P =0.0017). Five eyes in each group experienced an IOP >21 mmHg and 3 triamcinolone-treated eyes required treatment for IOP.

***Reference: Clin Experiment Ophthalmol. 2019;47(Supp 1;P0405)***

## Intravitreal injections for diabetic macular oedema in rural Western Australia – a population-based needs analysis of treatment coverage in 2018

**Presenter:** Meyer J

**Summary:** A retrospective audit of all intravitreal injections delivered by Lions Outback Vision during 2018 was used to determine the population-based needs for treatment of diabetic maculopathy in three regions of Western Australia. Demographic and injection data were extracted from a centralised database. Population-based need for treatment was estimated using ABS census data and known diabetes and DME prevalence rates for Aboriginal and non-Aboriginal Australians. The audit showed that 1326 injections were delivered to 301 patients across 25 locations. Of these, 371 injections were for 106 patients with DME in the Kimberley, Goldfields and Pilbara regions. Further analysis of these regions showed treatment coverage was 28%, 20% and 47%, and the average number of injections per was 2.5, 2.1 and 4.6 in the Kimberley, Goldfields, and Pilbara respectively. The results of the audit demonstrate improved coverage and frequency of injections in rural Western Australia is required.

***Reference: Clin Experiment Ophthalmol. 2019;47(Supp 1;S3003)***

**Expert Comment:** Many of our patients presenting for cataract surgery will have co-existing diabetic eye disease, some diagnosed and some not. The Auckland study found 4% of diabetics had potential sight threatening maculopathy (DME) at their first diabetic screening visit, and DME is still being diagnosed for the first time during the workup for cataract surgery, highlighting the public health need of increasing diagnosis of asymptomatic eye diseases. Visual outcomes are likely to be worse in patients in whom surgery is deferred until late when it is not possible to identify or adequately treat DME before cataract surgery. DME should be adequately treated before surgery as pre-existing maculopathy may be aggravated postoperatively with worse visual outcomes. The anti-VEGF era has dramatically improved outcomes, and treatment strategies now include laser photocoagulation or pharmacotherapy with intravitreal injections of anti-VEGF agents or steroids, with a growing tendency toward earlier cataract surgery. The results presented by Lim *et al.* found both bevacizumab and triamcinolone improve BCVA in eyes with DME when used during cataract surgery and as required post-operatively, however, only triamcinolone resulted in a sustained reduction in central macular thickness and a lower treatment burden over the 12 months after surgery. The choice of drug was based on cost and availability, and the benefits with triamcinolone need to be carefully balanced against the increased risk of steroid-related IOP elevation. The role of steroid implants for DME is still being evaluated.

## Importance of Individualised Glaucoma Management

### Lessons from the United Kingdom Glaucoma Treatment Study (UKGTS) and Laser in Glaucoma and Ocular HyperTension (LiGHT) study

**Presenter:** Garway-Heath D

**Summary:** The most common treatment for primary open angle glaucoma and ocular hypertension is topical treatments that lower IOP. Although selective laser trabeculoplasty (SLT) is a safe alternative, it is not commonly used in the first-line setting. In this randomised, masked, placebo-controlled trial, patients (N=718) with open angle glaucoma were assigned to an initial treatment of SLT or latanoprost, a topical prostaglandin analogue. The primary outcome was quality of life and secondary outcomes included cost-effectiveness and clinical parameters. There was no significant difference in quality of life between treatment groups. Approximately 74% of patients starting with SLT were at treatment target for at least 3 years without the need for drops. In addition, the eyes of patients in the SLT group were within target IOP at more visits (93.0%) compared to the latanoprost group (91.3%). Glaucoma surgery to lower IOP was required in no SLT-treated patients and in 11 latanoprost-treated patients. The SLT group was also more cost-effective.

***Reference: Clin Experiment Ophthalmol. 2019;47(Supp 1;L08)***

**Expert Comment:** Much is known about glaucoma therapeutics and management, however despite the global uptake of prostaglandins, there was a lack of evidence of the protective effect in the scientific literature, leading to the United Kingdom Glaucoma Treatment Study (UKGTS). This is an important study as it looked at quality of life and visual field progression, not simply IOP alone, and was designed to measure progression quickly by clustering tests at the beginning and end of a two-year follow-up period compared to the traditional three VF tests per year evenly spaced over the same period. The study found that a 20% IOP reduction on latanoprost was associated with a relative risk reduction of VF progression by 50%, practically meaning that we need to treat eight patients with glaucoma in order to prevent one VF progression in a two-year time period. Another important clinical observation from the study is that some patients progress rapidly, and so close monitoring and treatment escalation may be needed, whereas other patients may not need immediate treatment because they are at low risk of visual disability during their lifetime. This highlights the need for individualised care and to comprehensively inform patients about the natural history of glaucoma and seek their preferences regarding management options of observation versus treatment.

## Congenital Cataract and the use of IOLs

### IOL use in children under age 2 years: What have we learned?

**Presenter:** Plager DA

**Summary:** The Infant Aphakia Treatment Study was a prospective, randomised, multicentre study designed to understand the role of IOLs in infants < 7months old undergoing unilateral cataract surgery. Patients were randomised to either IOL or contact lens. After 5-years of follow up there was no difference in visual outcomes, however the IOL group had significantly higher reoperation and complication rates. The findings from the study led to the recommendation that IOLs should not be used in infants <7 months old unless there are extenuating circumstances. A second study, the Toddler Aphakia and Pseudophakia Study retrospectively examined the results of cataract surgery in children aged 7-24 months. The surgeons were the same as those in the first study, and surgery was conducted at a similar time. The second study confirmed that the adverse events reported in infants aged <7 months was related to their very young age.

***Reference: Clin Experiment Ophthalmol. 2019;47(Supp 1;L03)***

**Expert Comment:** The rapid improvement in microsurgical instrumentation and techniques has impacted the management of congenital cataract. The Infant Aphakia Treatment Study (IATS) studied the difference in managing infants with surgical aphakia with either a contact lens or IOL. Based on these results, the investigators recommended that when operating on an infant younger than 7 months of age with a unilateral cataract, that the eye be left aphakic and focused with a contact lens. IOL implantation at the time of cataract surgery should be reserved for those infants where, in the opinion of the surgeon, the cost and handling of a contact lens would be so difficult for the parents as to result in significant periods of uncorrected aphakia and the subsequent high risk of amblyopia. A 2019 systematic review and meta-analysis by Zhang *et al.* suggests primary IOL implantation for bilateral congenital cataract surgery in patients under 2 years of age is associated with a lower risk of secondary glaucoma, however for unilateral congenital cataract surgery, the incidence was very similar in eyes with and without primary IOL.

## New Techniques for Managing Corneal Disease

### Corneal neurotisation for neurotrophic keratopathy: A multicentre experience

**Presenter:** Aujla J

**Summary:** Outcomes for 8 patients with neurotrophic keratopathy who underwent corneal neurotisation surgery in Australia and Israel have been collated and reported. The surgery was performed by oculoplastic and plastic surgeons by either direct neurotisation using the contralateral supraorbital nerve or by use of an interpositional sural nerve graft to either the ipsilateral or contralateral supraorbital/supratrochlear nerves. The average surgical time was 4 hours. After a mean of 29 months follow-up, mean corneal sensibility improved from 8.4 ± 9.9 mm to 30.9 ± 20.6 mm. Almost two thirds of patients improved in at least 2 out of the 3 main outcome measures, which were corneal sensibility, visual acuity and corneal health. Visual acuity improved in 62.5% patients, average corneal sensibility improved in 50% patients and corneal health improved in 75% patients. There were no reports of deterioration in condition or intraoperative or postoperative complications.

***Reference: Clin Experiment Ophthalmol. 2019;47(Supp 1;S1010)***

### Development of a printable collagen ink for corneal wound treatment

**Presenter:** Song Y

**Summary:** In this study, *ex vivo* porcine cornea with either a stromal wound at a depth of 250 µM or a 0.8 mm perforation were used to examine the effect of a printable collagen ink on treating corneal wounds. Collagen ink prepared from bovine collagen was printed via extrusion printing onto the wounds. Adhesiveness and sealing conditions were examined after crosslinking. The crosslinked collagen ink had more than 90% of transmittance of visible light and was able to fill the stromal defect and seal the corneal perforation at an IOP of 22 mmHg. When tested *in vitro* on corneal epithelial and stromal cells, the collagen supported the proliferation of the cells.

***Reference: Clin Experiment Ophthalmol. 2019;47(Supp 1;S1007)***

**Expert Comment:** Acute corneal perforation and chronic neurotrophic keratopathy are conditions often associated with infection, ulceration, scarring and poor visual outcomes. Traditional management options for neurotrophic keratopathy include ocular lubricants, topical antibiotics, autologous serum drops, contact lenses, amniotic membrane grafts, and tarsorrhaphy, but these do not address corneal sensation and the ability of the eye to respond appropriately to stimuli and maintain a healthy ocular surface. These patients also do poorly with corneal transplantation, because the same condition will recur in the corneal graft resulting in failure. Corneal neurotisation is an emerging surgical treatment option for the management of neurotrophic keratopathy. Many cases are associated with other cranial nerve palsies, especially facial nerve damage from cerebello-pontine angle tumours. Treatment depends on the degree of nerve lesion and on the risk of the corneal damage based on the amount of lagophthalmos, the quality of Bell's phenomenon, the presence or absence of corneal sensitivity and the degree of lid retraction. Corneal ulceration is a common problem in Australia and developing countries. Each year more than 55,000 Australians present to hospitals with corneal ulcerations. The 3D printing pen works by releasing bio-ink directly onto the eye to help corneal cells regenerate and create a biological barrier to ongoing damage, including infection. This technique can accelerate feeling, minimise patient pain and reduce recovery time and could potentially benefit many thousands of patients locally and across the globe and improve the outcomes of glue-only for corneal perforations in the emergency department setting.





 