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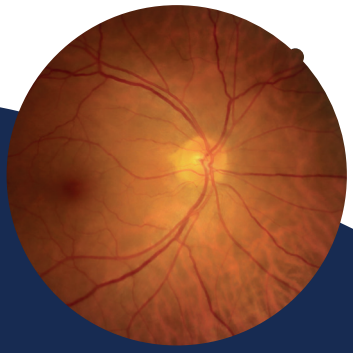

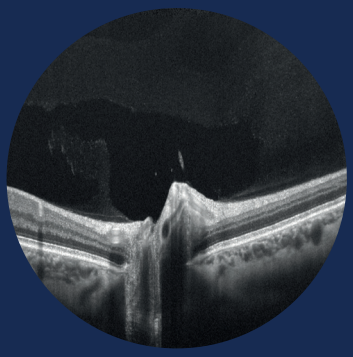

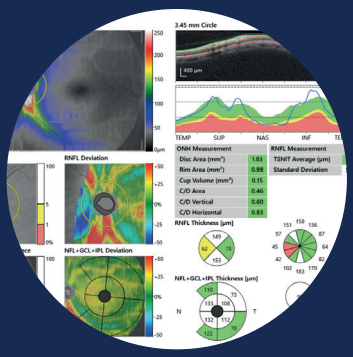

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FROM THE EDITOR

Welcome to *glaucoma*

Andrew Tatham,
Consultant Ophthalmologist;
Princess Alexandra Eye Pavilion,
Edinburgh, UK.

Welcome to this special supplement from *Eye News* dedicated to one of the most pressing challenges in ophthalmology: glaucoma. As your guest editor, I am pleased to introduce you to a comprehensive exploration of this sight-threatening disease and the strides we've made in understanding, diagnosing and treating it.

In an era where the population is ageing and there is a need for people to stay active well into older age, glaucoma's prevalence demands our attention. It silently creeps, often unnoticed, affecting millions worldwide. It is a time to embrace the transformative breakthroughs we are at the cusp of but also learn from the developments of the past.

At the time of writing, National Eye Health Week 2023 has begun, a time which gives an opportunity to pause and reflect not only on the challenges of here and now but our history, too, our agendas moving forward and the shared perspectives from the ophthalmic community worldwide. Reflecting this, our contributors have provided a wide and varied selection of articles which look to glaucoma from several distinct positions.

Petya Popova and Neeru Amrita Vallabh's *A glance into the past: tracing the history of glaucoma treatment* delivers a thorough breakdown from the earliest foundations of understanding glaucoma through to MIGS and further developments brought about by the technological advancements of the 21st century.

Widening our understanding of neovascular glaucoma, one of the most aggressive forms of this disease, comes a substantial review by Saajan Ramji, Saurabh Goyal, Jairo Torres, Obeda Kailani and Abdus Samad Ansari. Together, the authors explore the causes of neovascular glaucoma, its diagnosis, treatment and literary context.

'Celebrating the past and anticipating the future', Glaucoma UK's Chief Executive, Joanne Creighton, delivers an insightful view of the charity's history and achievements as they enter their Golden Jubilee 50th year. Joanne begins Glaucoma UK's story from the founding vision of Ronald Pitts Crick operating out of a spare bedroom in an NHS hospital's nurse accommodation and takes us all the way to its current operations leading the way in supporting patients and doctors, including its association with the UK and Eire Glaucoma Society (UKEGS).

The lens is also cast over the international community, with Viola Ninsiima, John Oyango, Daniel Atwine and Simon Arunga detailing *Diagnosis of glaucoma in the community in Uganda: The Glaucoma Screening and Treatment (GLAST) project for Southwestern Uganda.* This article dives into the particular qualities of GLAST while also providing an influential view of the challenges and the incredible achievements from fellow healthcare professionals across the globe.

There is also an educational snapshot of the different roles in glaucoma care, delivered by Lynne Hadley, Juliat Burns, Emma Coleman and Scott Jones from the The Association of Ophthalmic Nurses and Technicians.

Together, these articles shed light on both the science surrounding glaucoma and the human stories behind it, illuminating the current state of glaucoma care and envisioning a future where blindness from this condition becomes an increasingly rare tragedy. Together, let's shape the future of glaucoma management and ultimately preserve the gift of sight for all.

Cover image:
Coutesy of Glaucoma UK.

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A glance into the past: tracing the history of glaucoma treatment

BY PETYA POPOVA AND NEERU AMRITA VALLABH

Glaucoma is a progressive optic neuropathy with characteristic optic nerve head changes, corresponding to visual field defects. Intriguing and often the silent thief of sight, the disease has fascinated and perplexed ophthalmologists throughout the ages. This article aims to unveil a brief summary of the story of glaucoma, exploring its origins, early observations and the evolving management strategies that have shaped the field of ophthalmology.

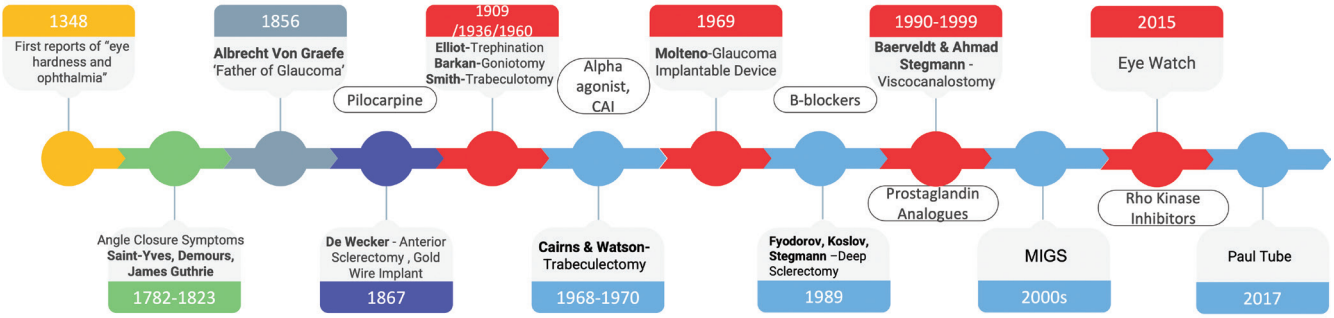

Figure 1: Timeline with historical key dates of glaucoma treatment advancement.

The earliest foundation of understanding

Glaucoma encompasses a number of different conditions where the raised intraocular pressure is the most important modifiable risk factor [1]. The term glaucoma originates from ancient Greek word 'glaukos', which means 'greenish blue' or a dull appearance of the pupil which was noticed in some cases of blindness. Clinical observations of the pupil were most commonly described as a characteristic of glaucoma, likely linked to the features of advanced angle closure pathology.

As early as 1348, an Arabian eye surgeon reported a form of ophthalmia characterised by eyeball hardness, hemicrania, dilated pupil and deteriorated vision [2]. For many centuries, the understanding of glaucoma's mechanism remained limited, and various theories emerged, including lens disorder, vitreous abnormality and choroiditis. In the 18th and 19th centuries, several scientists described clinical signs and symptoms suggestive of angle closure glaucoma. Saint-Yves, in 1722, noted an "inflamed eye" with foggy vision and pain. Demours, in 1818, observed symptoms of coloured rings around light sources and James Guthrie, in 1823, identified eyeball hardness [2].

The 19th century

In the 19th century, significant progress was made in the field of ophthalmology with the development and advancements of key medical instruments such as the ophthalmoscope, tonometer and early primitive gonioscopy devices. These innovations greatly contributed to a deeper understanding of the eye's anatomy and the crucial role of intraocular pressure in glaucoma. Among the pioneers in this era, German ophthalmologist Von Graefe stands out as a prominent figure, often referred to as the "father of glaucoma" for his ground-breaking contributions to the field. He established the initial classification of glaucoma, encompassing acute, chronic and secondary cases [3]. Notably, in the absence of ophthalmic local anaesthesia during that time, Von Graefe developed one of the earliest tonometers, which he placed on the eyelid to measure intraocular pressure [3].

Von Graefe introduced iridectomy as a treatment for acute angle closure glaucoma and presented his outcomes at an international congress in 1857 [3]. In addition, in 1867, de Wecker described the anterior sclerectomy, marking the first external filtration procedure for glaucoma [4]. Furthermore, de Wecker elucidated the utilisation of gold wire to facilitate fluid drainage outside the sclera, as an implant in glaucomatous patients without response to iridectomy [4]. This was the earliest technique of shunt surgeries described at the time. Following this, in 1906, Rollet used horsehair and in 1912, Zorab and Mayou reported the use of permanent silk thread implants [4].

The 20th century – medical and surgical advancements

Towards the beginning of the 20th century, suggestions were made for both cyclodialysis and ciliodestruction as treatment approaches for glaucoma. These four approaches, including relief of pupillary block, external filtration, internal filtration and cyclodestruction, which were described by Von Graefe, de Wecker and other pioneers, remain fundamental surgical techniques employed in modern glaucoma surgery [4].

The early Elliot trephining technique aimed to establish a subconjunctival fistula for aqueous humour drainage. It involved grasping a conjunctival fold with forceps about 10-12mm above the upper limbus and creating a 25-30mm incision running concentrically with the limbus, dissecting down to the sclera [14]. However, this method led to issues like cataracts, flat anterior chamber and infection, causing it to fall out of use [6]. In 1958, Sheie introduced a similar procedure involving a scleral incision and heat cautery to form a permanent filtering track, with comparable outcomes to trephination [6].

One of the earliest recorded medical treatments for glaucoma was pilocarpine, a direct-acting cholinergic drug introduced in the late 19th century [2]. Initially, it was believed that the mechanism of action solely relied on miosis, which helped in opening the angle. However, it was observed that pilocarpine administration also led to reduced intraocular pressure in cases of primary open-angle glaucoma. Additionally, subconjunctival epinephrine, a sympathomimetic drug with mydriatic properties, demonstrated a decrease in intraocular pressure, further supporting the hypothesis of multiple mechanisms of action, including aqueous reduction [2]. In 1954, carbonic anhydrase inhibitors, such as acetazolamide, were introduced [2]. The introduction of beta-adrenergic blocking agents followed more than 20 years later.

In the late 1990s, prostaglandin analogues, such as Unoprostone in Japan (1994) and Latanoprost in the USA and Europe (1996), revolutionised open-angle glaucoma treatment. These ocular hypotensive drugs, which predominantly increase the uveoscleral flow, offered a well-tolerated alternative to existing therapies [17]. This breakthrough marked a significant advancement in topical agents for glaucoma management [5].

Translational medicine research in the 1990s paved the way for a 21st-century breakthrough in glaucoma treatment with the discovery of Rho kinase inhibitors. Targeting the Rho kinase pathway, known for its roles in cellular functions like adhesion, migration, proliferation and cytoskeleton regulation, these inhibitors have demonstrated their efficacy in reducing aqueous outflow resistance and lowering intraocular pressure [18]. Furthermore, ongoing research suggests potential benefits in neuroprotection and improving ocular blood flow [18].

Ripasudil (Glanatec®) received approval in Japan for glaucoma and ocular hypertension treatment in 2014, while Netarsudil (Rhopressa®), a Rho kinase inhibitor and norepinephrine transporter inhibitor, gained approval for glaucoma treatment in the USA in late 2017. In 2023, fixed dose combination of Netarsudil (novel Rho-kinase inhibitor) and Latanoprost was released in the UK, known as Roclanda® (Santeen). These innovations offer new avenues for effective glaucoma management.

In 1968, the Cairns trabeculectomy procedure was introduced with the initial aim of restoring physiological outflow by only removing the juxtacanalicular trabecular meshwork (TM). However, the technique resulted in a sclerokeratectomy procedure that reduced intraocular pressure by allowing suprascleral fluid flow and hence formed a bleb. Cairns himself described the intention of the operation as follows: “excise a short length of the Canal of Schlemm, with its trabecular adnexae, thus leaving two cut ends opening directly into aqueous humor, with no trabecular tissue remaining as a barrier” [7]. In 1970, Watson modified the Cairns trabeculectomy, which closely resembles the modern trabeculectomy technique [8]. For many clinicians, trabeculectomy remains the gold standard in subconjunctival bleb-forming surgery with the increasing use of episcleral Mitomycin-C (MMC) application.

The application of MMC was first reported by Chen in 1983 [9]. Similarly, the use of other antifibrotics, such as postoperative subconjunctival 5- fluorouracil, were reported, but due to ocular surface toxicity has been largely replaced by MMC use [10]. β radiation , carried out at the time of glaucoma drainage surgery, has also been shown to lead to clinically important benefit on control of intraocular pressure. It has an appeal in resource limited settings and the probe is self-sterilising. Some of the potential complications include cataracts, conjunctival and scleral necrosis [4]. Other antifibrosis treatments studied included oral prednisolone, colchicine, non steroidal anti-inflammatory drugs (NSAIDS), anti-vascular endothelial growth factor injections and use of an Ologen implant® (ProSys International) [8].

The advancing glaucoma surgical techniques during the 20th century and the concept of creating a passage of the aqueous humour to the suprascleral space led to the idea of a surgically implanted device. In 1969, Molteno® developed the first successful glaucoma drainage device consisting of a tube with a plate [11]. Since then, several non-valved and valved glaucoma devices, with varying materials and surface areas, have been developed such as the non-valved Baerveldt® (Johnson & Johnson Surgical vision), valved- Ahmed® (New World Medica), Paul tube® (Advanced Ophthalmic Innovations Pte Ltd), Molteno 3® and others. Glaucoma drainage devices are designed to divert aqueous humour from the anterior chamber to an external plate fixated on the sclera. One of the risks of these implantable devices is post-operative hypotony. This has led to innovative medical engineering designs to improve hypotony rates including alteration of the plate surface area, valves, tube diameter and surgical techniques such as ligation of the tube. Another novel device is the Eyewatch® (Rheon Medical), which is an external non-invasive magnetic control unit, with the aim of titrating IOP control.

Non-penetrating glaucoma surgery (NPGS) was also described at a similar time as trabeculectomy. It aims to reduce intraocular pressure by enhancing the natural aqueous outflow channels, while reducing outflow resistance in the inner wall of the Schlemm’s canal and juxtacanalicular TM. Sinusotomy, described by Krasnov in 1964, was the earliest NPGS surgical technique, where a lamellar band of sclera was removed, opening Schlemm’s canal over 120° [4]. In 1989, Fyodorov and Kozlov first described deep sclerectomy as it is known and performed today.

Advancements in angle surgery have also been notable. The first angle surgery was performed by Tailor in 1891, followed by goniotomy in 1936 and trabeculotomy in 1960 [4]. Ab externo trabeculotomy serves as a primary surgical choice for congenital glaucoma, especially in cases where goniotomy is not feasible due to corneal oedema or limited visibility. Its goal is to establish a direct connection between Schlemm’s canal and the anterior chamber. This technique was pioneered by Hermann Burian and Redmond Smith in 1960. Burian performed it on a 17-year-old Marfan syndrome patient with open-angle glaucoma, while Smith conducted the procedure on a patient with choroidal melanoma, allowing for histopathological examination post-trabeculotomy [15]. Additionally, ab interno surgical approaches have emerged. Ab interno trabeculectomy, using a handheld electrocautery device developed by George Baerveldt, made its USA debut in 2004. Other angle surgery procedures and devices include the Kahook Dual Blade®, excimer laser trabeculotomy, and GATT (iTrack® or with 5-6/0 Prolene suture) all now considered as minimally invasive glaucoma surgeries.

Viscocanalostomy, introduced by Stegmann in 1999, is akin to deep sclerectomy but focuses on securely suturing the scleral flap and injecting viscoelastic into the cut canal ends to enhance trabecular outflow without forming a bleb. Canaloplasty, similar to viscocanalostomy but involving dilation of the canal in all four quadrants, was first described by Cameron in 2006. Recent advancements in abinterno techniques and instrument innovation has allowed viscocanaloplasty to be performed using novel devices, including the I Track and subesquently the I Track Advance (Nova Eye Medical) [8].

The 21st century – trans-trabecular drainage

In the early 2000s, the concept of minimally invasive glaucoma surgery (MIGS) emerged. It marked a resurge of innovations for glaucoma surgical management, which continues today. This novel approach to treat glaucoma aims to reduce invasiveness with improved patient safety and fewer complications.

One of the first MIGS procedures, aimed to improve trabecular outflow, is the iStent® developed by Glaukos [8,12]. It is a heparin-coated, non-ferromagnetic L-shaped stent made of lightweight titanium which is aimed to bypass the TM and re-routes the

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aqueous directly into Schlemm's canal. The first human implant iStent® (Glaukos) was in 2001 [12]. In recent years, the potential to combine such surgeries with a cataract surgery has propelled MIGS to take up a new role in the way glaucoma can be managed. Other MIGS examples of trans-trabecular drainage with a device includes the Hydrus Microstent® (Alcon), which is a Schlemm's canal scaffold made of nitinol [8].

However, as trabecular outflow resistance is complexly affected not only by the TM, but also Schlemm's canal, TM herniations and the collector channels, some MIGS devices have been introduced with an aim to address multiple components to decrease resistance. For example, the OMNI surgical system® (Sight Sciences) is a two-step MIGS microcatheter system which combines viscodilation of Schemm's canal and trabeculotomy to enhance aqueous humour outflow and decrease intraocular pressure. Apart from the previously mentioned ab interno trabecular surgeries without residual device, there is also the excimer laser trabeculotomy (ELT), which makes multiple laser channels through the TM and inner wall of Schlemm's canal using a 308nm Xenon chloride laser making 10 microchannels [8].

The 21st century – subconjunctival drainage with a device

The XEN® gel implant (Allergan Inc.) is a MIGS device intended for non-incisional ab interno procedures to achieve subconjunctival drainage. However, in clinical practice, it has been implanted using various techniques, both ab interno and ab externo, as well as sub-Tenon instead of subconjunctival placement. This variability has resulted in a high and unpredictable rate of XEN revisions and the need for needling [8].

PRESERFLO Microshunt® (Santen Inc.) is another MIGS device, which is an 8.5mm drainage lumen, implanted ab externo with intraoperative MMC, producing a bleb under sub-Tenon and conjunctiva. Both of these MIGS devices facilitate subconjunctival flow introducing the term minimally invasive bleb surgeries.

The 21st century – suprachoroidal drainage with a device

The Cypass® (Alcon Inc.) is suprachoroidal drainage devices first introduced in 2012 and approved by the USA Food and Drug Administration (FDA) in 2016. The CyPass Microstent was aimed to be combined MIGS device used in conjunction with cataract surgery. However, the COMPASS study showing five-year post-surgery data showed CyPass Microstent patients have significant corneal endothelial loss and the device was withdrawn in 2018 [16]. The MINIject® (iSTAR Medical) is the newest ab interno supraciliary device, made by soft microporous flexible silicone.

Conclusion

The history of glaucoma has been a fascinating journey for ophthalmologists, as this progressive optic neuropathy continues to intrigue and perplex. Throughout the centuries, the field has witnessed numerous developments and innovations, yet the fundamental conceptual principles of glaucoma surgery have endured over the past 100 years.

The 20th century witnessed substantial progress, with the introduction of medical therapies like pilocarpine and carbonic anhydrase inhibitors, followed by innovative surgical approaches like trabeculectomy, glaucoma drainage devices and non-penetrating glaucoma surgeries. More recently, the concept of MIGS has sparked a resurgence of innovations, promising less invasive procedures with improved safety profiles. It is important to note that the summary did not encompass the use of lasers in glaucoma surgery, a significant aspect in contemporary practice.

As we move forward, continued research and refinement of existing techniques will propel glaucoma management to new heights, further enhancing patient outcomes and preserving sight, paving the way for a brighter future in the battle against this often-silent thief of vision.

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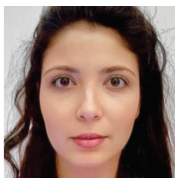
TAKE HOME MESSAGES

- The first topical medical treatment for glaucoma was pilocarpine.
- In 1968, the Cairns trabeculectomy procedure was introduced.
- In 1969, Molteno developed the first successful glaucoma drainage device consisting of a tube with a plate.
- Sinusotomy, described by Krasnov in 1964, was the earliest NPGS surgical technique.
- In the early 2000s, the concept of MIGS emerged. It marked a surge of innovations for glaucoma surgical management, which continues today.

Authors



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MINIMALLY INVASIVE GLAUCOMA SURGERY WITH TRABECULAR MICRO BYPASS MAY SLOW FUNCTIONAL PROGRESSION

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The role of true endpoints in glaucoma trials and the effect of iStent devices on functional progression

To date, intraocular pressure (IOP) remains the only modifiable risk factor for glaucoma progression, and as such, is the cornerstone of all glaucoma treatments. Intraocular pressure measurements are also readily available, convenient, and inexpensive, making them attractive endpoints for glaucoma trials. Yet, **most ophthalmologists would agree that the primary goal of any glaucoma treatment is not to lower IOP, but to preserve patient's functional vision and quality of life.** Besides, while IOP is an important factor in glaucoma management, it was never formerly validated as a surrogate for true endpoints or a predictor for functional loss in glaucoma. This is the main reason why a number of authors and guidelines, including the World Glaucoma Association consensus have been calling for a shift in the focus of glaucoma clinical trials towards biomarkers that would better represent disease stability, such as structural, functional or even composite endpoints.[1,2]

"The primary goal of any glaucoma treatment is not to lower IOP, but to preserve patient's functional vision and quality of life".

Minimally invasive glaucoma surgery (MIGS) are good examples of how **focusing solely on IOP endpoints may lead to a biased approach to decision making in glaucoma.** In an ongoing meta-analysis of the effect of the **iStent devices** on functional progression, we identified **24 individual trials reporting pre-operative and post-operative visual field data for a total of 1305 eyes.**[3] When looking at the mean deviation (MD), **half of these studies reported either functional stability or improvement between baseline and the last timepoint.** Considering all the identified studies, the overall weighted **mean progression rate was well under 0.1 dB per year, over a mean duration of 40 months** – below most reported progression rates for treated glaucoma. Interestingly, while mean IOP reduction ranged widely across the studies [15.2%-42.7%], it correlated poorly with functional progression measures, further supporting the idea that, while an important measurement, IOP may not be a suitable surrogate endpoint for functional stability. A number of explanations have been put forward by various authors, including the fact that, within physiological values, **IOP does not appear to be directly correlated with functional progression in mild glaucoma.**[4] In addition, static IOP endpoints rarely take into account other factors responsible for glaucoma progression such as endogenous and exogenous IOP fluctuations, patient compliance, or non-pressure dependent mechanisms.

"In the case of the iStent devices, the observed functional outcomes suggest that early intervention may have a role to play in mild glaucoma where MIGS procedures could help slow progression".

This specific example shows that, as clinical trial methods evolve and data accrue, true endpoints are gradually becoming a reality in glaucoma. Functional and structural endpoints take a different perspective on treatment outcomes. The greater emphasis on the broader picture they provide may lead to new, more clinically-relevant conclusions.

Finally, and generally, these observations are another reminder that, **as clinicians and researchers, we should strive to shift our focus away from traditional static endpoints, towards more patient-centered measures such as functional stability and quality of life.**

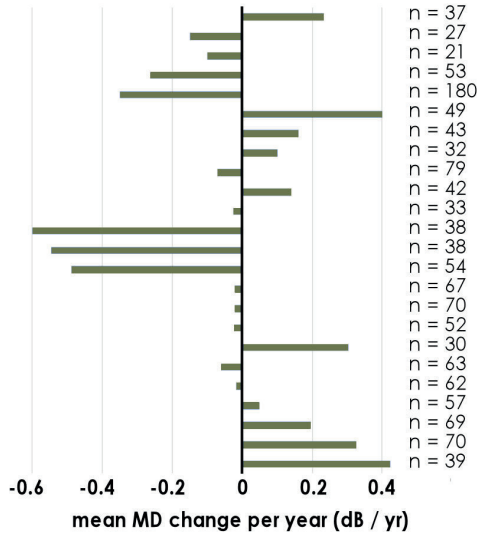

Figure 1 – Mean change in visual field mean deviation (MD) in decibel per year across all 24 identified studies.

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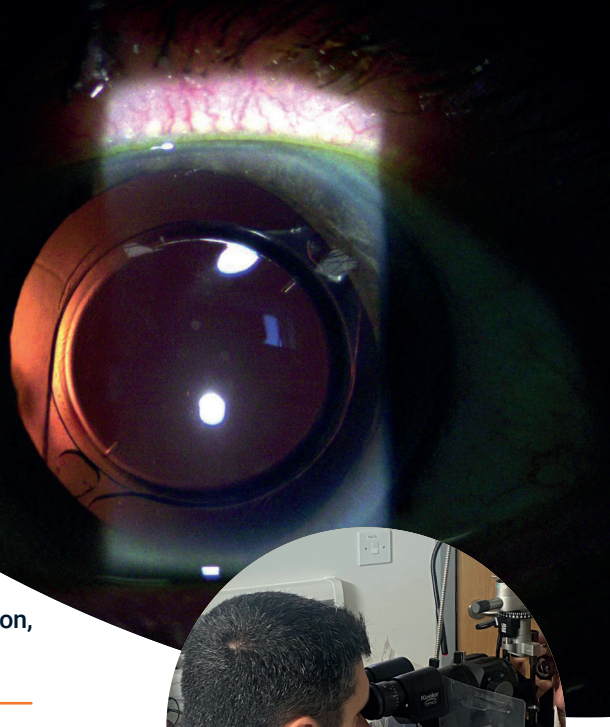
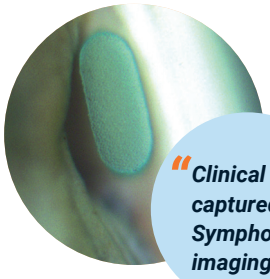


A better future in eyecare, *together*

Nicola Bennett, Clinical Training Manager at Keeler has been talking to Dr Chrys Dimitriou, an award-winning substantive Consultant Ophthalmic Surgeon, about his comprehensive approach to managing cataracts and glaucoma.

From his busy practices at The Colchester Eye Centre and Oaks Ramsay Hospital, Dr Dimitriou specialises in performing minimally invasive glaucoma surgery (MiGS) procedures. These involve the implantation of highly specialised devices to improve the drainage of aqueous humor from the anterior chamber of the eye to lower intraocular pressure, a hallmark of glaucoma therapy.

By combining the benefits of MiGS procedures with the advanced digital imaging enabled by a slit lamp examination, a cornerstone tool of ophthalmology, Dr Dimitriou is committed to optimising treatment outcomes and enhancing the quality of life for each and every one of his valued patients.



"Clinical images are captured using the Keeler Symphony KSL H5 digital imaging system..."

He explains "As a dedicated specialist eye surgeon, my approach to managing this intricate co-existence of cataracts and glaucoma involves the skillful integration of two technologies.

Firstly, I meticulously assess the placement and functionality of MiGS micro-implants using the slit lamp's precise magnification and illumination capabilities. This confirms optimal positioning and efficient drainage.

Clinical images are captured using the Keeler Symphony KSL H5 digital imaging system, which is extremely important in any clinical assessment but especially following on from MiGS angle surgery.

This has proven invaluable in everyday practice, providing me with precise surgical peri-operative evaluation and intervention with vigilant post-operative care.

I am then able to view the anterior chamber and angle configuration with unparalleled clarity. This vigilance helps me monitor drainage pathways and any post-operative anatomical variations."

Patient education and personalised treatment adjustments.

The strategic combination of innovative surgical intervention with cutting-edge imaging technology offers numerous advantages to his patients' care.

According to Dr Dimitriou, "Through capturing these amazing and eye-opening slit-lamp images using Keeler Kapture software, I am able to educate my patients by providing visual evidence of their surgical procedure."

"...the integration of digital imaging through slit lamp examination becomes pivotal."

Following on from glaucoma drainage surgery, diligent post-operative monitoring is paramount. This step ensures the surgery's success and allows for early detection of any potential complications. This is where the integration of digital imaging through slit lamp examination becomes pivotal.

Dr Dimitriou continues "I can then schedule follow-up appointments to capture images over time, enabling a continuous assessment of my patients' care and recovery progress, to guide personalised treatment adjustments, as necessary.

This approach also brings a deeper patient understanding and compliance with their post-operative care instructions."

A better future in eyecare, together.

Combining many years of experience using the Symphony Digital Imaging System with the support he receives from Clinical Training Manager, Nicola Bennett, Dr Dimitriou is confident he gains the best possible view for evaluating the treatment outcomes for his patients.

Dr Dimitriou is a specialist in modern cataract surgery and glaucoma therapy and is Glaucoma Lead at ESNEFT Colchester, Essex, UK.

He regularly performs Trabeculectomy and Aqueous Shunt Surgery with Baerveldt Tubes, EyeWatch, EyePlate and Ahmed ClearPath and routinely uses devices like MINIject, Hydrus, iStent inject w, Preserflo, XEN45, TrabEx+, OMNi, iTrack Advance, EyeWatch, ELiOS and MiMS.

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Diagnosis of glaucoma in the community in Uganda: The Glaucoma Screening and Treatment (GLAST) project for Southwestern Uganda

BY VIOLA NINSIIMA, JOHN ONYANGO, DANIEL ATWINE, SIMON ARUNGA

Background

Glaucoma is a major cause of visual impairment and irreversible blindness affecting 76 million people globally [1]. The burden of glaucoma is highest in sub-Saharan Africa, where the prevalence is estimated to be 4%, twice the global average [2]. In Uganda, the population-based prevalence of glaucoma is unknown. However, a systematic review of Rapid Assessment of Avoidable Blindness (RAAB) data from Africa in 2013 reported that glaucoma contributed to 38.5% of all blindness in Uganda, the second in Africa after Nigeria, which had 42% [2]. Recent global estimates have predicted a substantial increase in absolute numbers of individuals affected in African populations over the next decade if no interventions are made [1].

Glaucoma is largely asymptomatic until the disease is advanced, at which point very little can be done to save sight. An ideal situation for reducing avoidable blindness due to glaucoma is having a system where the population is knowledgeable about the condition, a strong mechanism to screen and find early cases, strong referral linkages to where the care is, an armamentarium of good treatment options, follow-up and rehabilitative services. Unfortunately, such a system does not exist in Uganda and many other resource-limited settings.

Mbarara University of Science and Technology, through the department of ophthalmology at Mbarara University and Referral Hospital Eye Centre (MURHEC), in collaboration with Christian Blind Mission (CBM), piloted a glaucoma screening and treatment project in Uganda that aimed to make a substantial contribution towards fighting this cause of avoidable blindness. Our project aimed to:

- Improve awareness of glaucoma among the population and primary health workers
- Make screening for glaucoma available at 24 primary health facilities, and
- Decentralise glaucoma diagnosis and treatment to three Regional Referral Hospitals (RRHs) in Southwestern Uganda.

The data generated from this project would be useful in informing national prioritisation of glaucoma in mainstream eye health budgeting and financing.

Approach

Figure 1 below shows how this project was implemented. In summary, MURHEC serves as a centre of excellence and training centre for upskilling ophthalmologists at the secondary level RRHs to provide glaucoma diagnosis and treatment. The ophthalmic

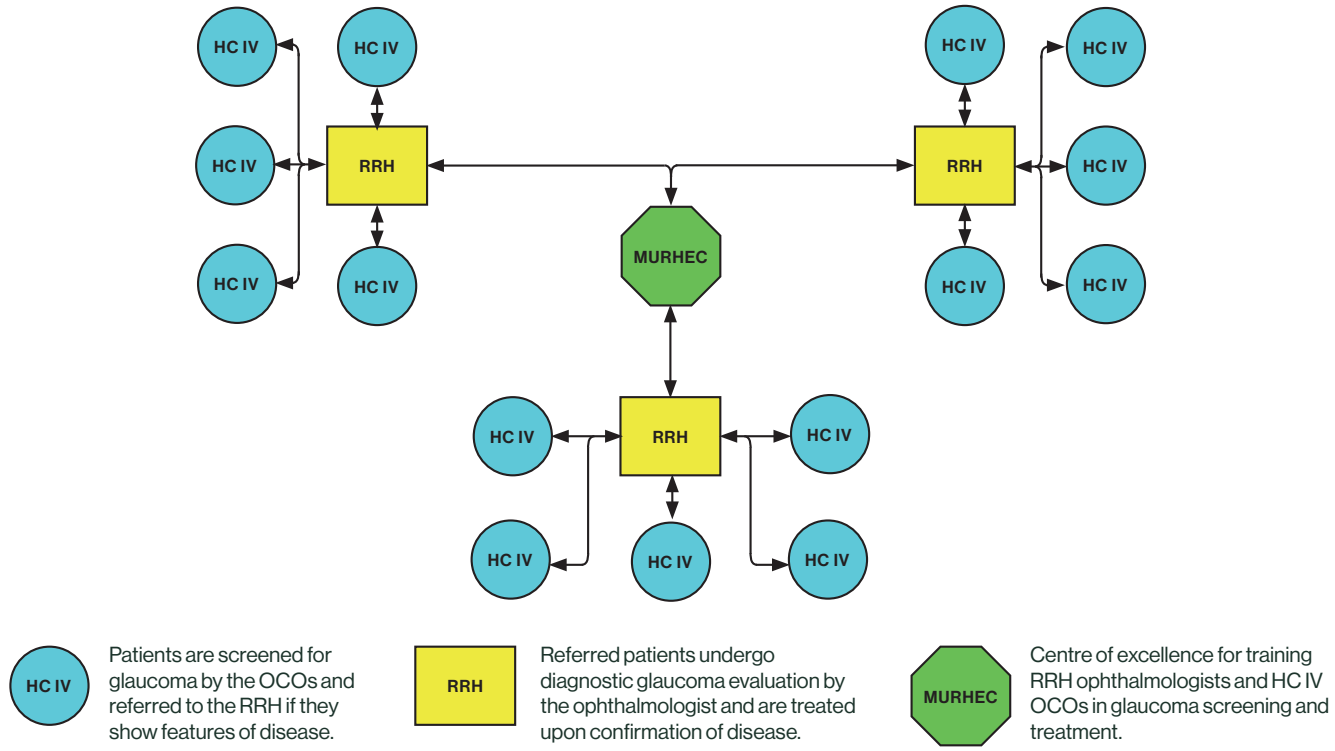

Figure 1: The implementation of the GLAST project.

clinical officers (OCOs) at the primary health centres (HC IVs) provide screening and referral for patients suspected to have glaucoma. Embedded into this was a baseline and endline assessment of the capacity of the health system to manage glaucoma.

Project milestones

Baseline assessment

Following the necessary ethics approvals and permissions, we surveyed 86 health facilities in Uganda to establish baseline data for the reported annual prevalence of glaucoma, capacity and challenges of managing glaucoma in the nation's health system. The findings were unsurprisingly poor. For example, our study revealed a gross under-diagnosis of glaucoma, at only 0.007%. Therefore, for every glaucoma case diagnosed, about 685 other cases were missed, highlighting the gross under-capacity to diagnose glaucoma within the health system. Underpinning these were low staffing levels, low levels of knowledge among the heath workers and a lack of equipment and drugs. We have since disseminated the baseline survey results on different fora including a GLAST meeting with district health officers, a Uganda Ophthalmology Society meeting and the College of Ophthalmology of Eastern, Central and Southern Africa (COECSA) congress in Lilongwe, Malawi in 2022.

Capacity building of the facilities in glaucoma diagnosis and management

This included training, equipment support and seed stock of consumables and drugs. Training included glaucoma diagnosis and management (medical, surgical and low-vision care) and eye health data capturing and reporting.

- Five ophthalmologists from five secondary-level hospitals in Uganda underwent glaucoma surgery training, which was conducted by Dr Fisseha, a Glaucoma Surgeon from the University of Gondar, Ethiopia.
- Three OCOs received low vision training.
- Twenty-six OCOs received refresher training on glaucoma diagnosis and medical management.
- Twenty-six data officers received training on eye health data capture and reporting into the Uganda Ministry of Health HMIS system.

Equipment for the secondary-level hospitals included iCare tonometer, slit-lamp with a 90-dioptre condensing lens and a visual field machine. Each hospital also received a bulk seed stock of sutures, lenses, glaucoma and cataract sets, viscoelastic and anti-glaucoma drugs.

In one year of project implementation, this has translated into 36,702 patients screened for glaucoma and 1404 diagnosed and treated.

Glaucoma sensitisation and awareness campaign

Perhaps one of the biggest successes of this intervention has been public engagement. This has been achieved through massive distribution of information, education and communication (IEC) materials translated into the local languages, education videos on glaucoma with sign language interpretation, use of local radio talk shows and several advocacy activities with the local political and health leaders. Our previous work showed that radio was an effective community mobilisation tool [3]. In addition, we set up glaucoma patients' associations in the different regions served by the secondary-level hospitals. In these associations, glaucoma patients organise themselves and pool money to complement government care. They provide peer-patient counselling for new patients and have been key in sensitising the population during radio talk shows.

Glaucoma networking

The glaucoma project in Uganda is linked to the Glaucoma-NET Decision-Intervention Support Cluster (DISC) led by Fatima Kyari and supported by the International Centre for Eye Health, London School

Figure 2: Health workers from MUST with the representative of the Ugandan president (centre) and the Uganda People's Defence Force brass band lead the public through a main street in Mbarara City, Uganda to create awareness during World Glaucoma Week.

Figure 3: A team of nurses doing person-to-person distribution of glaucoma brochures on one of the streets in Masaka City, Uganda as part of a sensitisation campaign.

Figure 4: Motorcycles are the most common method of transportation in urban settings in Uganda; we distributed branded reflective jackets to help encourage people to have glaucoma screening.

of Hygiene & Tropical Medicine, UK [4,5]. The platform runs monthly online meetings that bring together individuals and groups working on glaucoma all over the world for a shared learning experience. These discussions have been instrumental in shaping the project delivery. For example, the session on 'Mitochondrial dysfunction and neurodegeneration in glaucoma' guided our approach on screening all relatives of 'index' glaucoma cases. The 'Publicity campaign for glaucoma' DISC session shaped our publicity campaign to achieve Top of Mind (TOM) and Tip of Tongue (TOT) for glaucoma in Uganda.

Key success

The project, the first of its kind in Uganda, has been able to create a glaucoma awareness in the mainstream health leadership and amongst political leaders, health workers and the public. Uptake of glaucoma screening, diagnosis and management has improved in the health system. There has been improved glaucoma and general eye health data capture and reporting because of the training of the data clerks from the health facilities. We plan to utilise this data in our advocacy engagement with the government for eye health financing. However, the uptake of glaucoma surgery is still low in the community.

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[all links last accessed September 2023]

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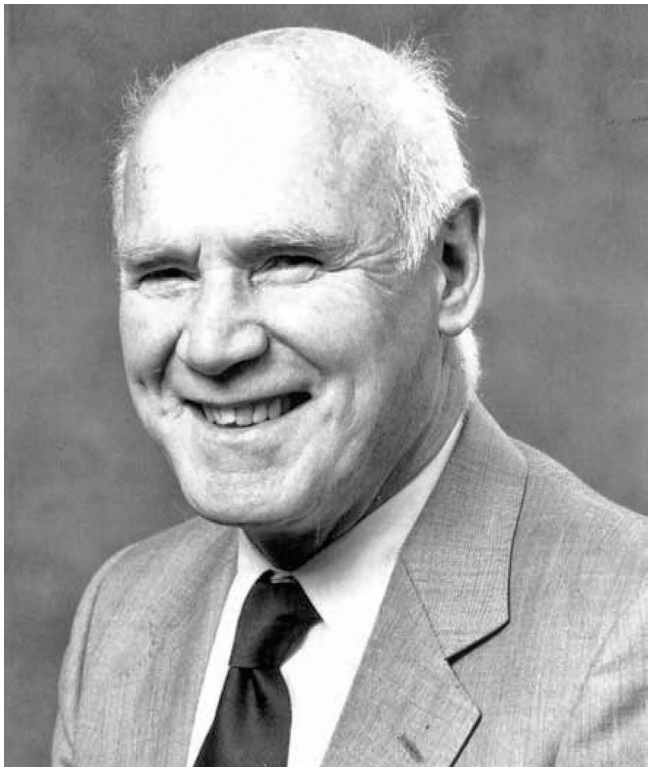
Celebrating the past and anticipating the future – Glaucoma UK turns 50

BY JOANNE CREIGHTON

With 2024 fast approaching, all of us at Glaucoma UK are looking forward with great anticipation and excitement to our 50th anniversary. It offers a welcome opportunity to reflect on the achievements of the last half century and the many ways in which the charity has made a difference to people living with glaucoma. And it has not been entirely our success, of course. Those achievements are also testament to the scores of professionals, from every walk of glaucoma care, who have worked alongside us in a joint mission to raise awareness, support individuals and, ultimately, bring an end to preventable sight loss from glaucoma.

As we celebrate this significant milestone, we will be mindful of our duty to look to the future and ensure that Glaucoma UK achieves even greater success in the next 50 years. Against a backdrop of growing NHS pressures and rising demand for ophthalmology services, the work of our charity has never been more important. So, in seeking inspiration for our future plans, where better to start than with the passion and insight that first brought our charity to life?



Glaucoma UK founder, Ronald Pitts Crick.

Origins and vision

The memory of our founder, ophthalmologist Ronald Pitts Crick, will loom large over our celebrations. Crick, who died in 2009, devoted much of his professional life to the study and treatment of glaucoma, although he is perhaps best known for pioneering the use of the operating microscope in British eye surgery. That pioneering spirit was certainly in evidence when he founded our charity.

Crick was aware, from his glaucoma clinic at Kings College Hospital, London that a lack of patient understanding was often a barrier to effective treatment. Recognising that it would be impossible to address education and awareness during appointments (still a challenge today, of course), Crick sought another way. Over a cup of tea at an informal meeting with colleagues and patients, Crick put forward his proposal for a new charity to fill the gap. He described his vision for increasing professional, public and patient understanding of the disease, and for funding research. That prospect was warmly welcomed by all present and thus the Glaucoma Association was born.

The beginnings were humble, with the new association operating out of a bedroom in the nurses' quarters of the hospital, with no phone, a wardrobe doubling as a filing cabinet and a bedside table as a desk. Undeterred by the lack of resource, the charity's early pioneers soon created a thriving operation and the name was changed to the International Glaucoma Association (IGA).

We owe much to Ronald Pitts Crick and his team of early supporters who worked so hard to bring his vision to life. That vision remains our lodestar to this day.

Glaucoma UK in 2023

Inevitably, the five intervening decades have seen ongoing evolution and growth. Our name was updated to Glaucoma UK a few years ago and we formalised our longstanding association with the UK and Eire Glaucoma Society (UKEGS) when it officially became part of the charity in 2019. UKEGS was established as a scientific society to promote and foster the interests of people living with glaucoma and to stimulate research by promoting the exchange of knowledge between glaucoma care professionals.

Our partnership with UKEGS underscores the essential connection between clinical and pastoral care. To achieve the best possible outcomes for people living with glaucoma, we need to continue to address the problem Crick identified so long ago: how to meet the medical, educational and pastoral needs of patients within the resource constraints of the hospital system.

In attempting to tackle this challenge, we see ourselves as 'pastoral partners', helping to provide continuity of support after patients leave the clinic. I am fond of describing our role as being like one arm of a hug, which has the patient in the centre, and which meets the arm of the medical professional on the other side. I am not sure it makes sense to everyone, but it is an image that works for me… and one I hope our founder may have quite liked.

Raising awareness and providing support

With an estimated 700,000 people in the UK living with glaucoma (but only half of them aware of it), increasing awareness of both the disease and the risk to individuals is a vital aspect of our work. We run campaigns throughout the year to highlight the importance of regular eye health checks for those who do not know they may have glaucoma – and signposting the services we provide for those who do.

For many, our helpline is the first port of call. The diagnosis of glaucoma can be a source of fear and anxiety, sometimes arising

Filming Glaucoma UK's Ramadan health information video.

weeks or months after the initial diagnosis. Our advisors, led by an ophthalmic nurse and supported by a clinical advisory panel of qualified glaucoma professionals, offer practical advice and emotional support to thousands of people every year.

In addition to professional advice, our amazing team of volunteer 'buddies', who kindly share their experience of the disease, are an invaluable source of comfort and insight for people facing difficult choices about treatment or surgical options.

Our support groups across the UK seek to bring patients and professionals together in just the way our founder envisaged. Perhaps the biggest change from those early days is that we can now deliver those groups digitally, too, allowing us to reach even more people at times more convenient to them.

For those seeking help and advice online, our website is a place where individuals can order a wide variety of information booklets or eye-drop dispensing aids – all of which are provided free, thanks to the enormous generosity of our wonderful donors and supporters.

Working with professionals

With the move to community-based services, we also feel we have an important role to play in supporting health professionals across the field of glaucoma care. We are committed to being a reliable source of up-to-date information and to providing access to effective professional networks for sharing best practice. To that end we offer a range of training options for professionals and a free professional membership scheme.

The UKEGS annual conference is a pivotal fixture in our calendar, offering delegates CPD points and two days of knowledge exchange and networking. We are delighted to announce that the conference in our anniversary year will be hosted by Ms Nishani Amerasinghe in Southampton from 9-10 October 2024. Details of the programme and booking arrangements will be updated on our website (www.glaucoma.uk/ukegs) during the year.

Funding research

We need to understand much more about what causes glaucoma, how it can be prevented, what are the most effective treatments and, ultimately, how it can be cured. Through our annual research programme, we support studies that seek answers to those questions by testing new medical and surgical models and exploring new ways of working. We are proud to support the Chair of Glaucoma and Allied Studies at University College London (currently held by Professor David Garway-Heath); and to work with partners including the Royal College of Ophthalmologists and the charity 'Fight for Sight' to deliver a research programme that will have a lasting impact on the lives of the people we serve.

> The growing momentum for a new national eye-health strategy is a real opportunity – we must ensure that it delivers for people living with glaucoma and those who care for them

Glaucoma UK info booklets.

UKEGS Conference 2022.

Looking to the future

As we embark upon the next 50 years of our journey, we have a particular focus on increased awareness and earlier diagnosis among those who are most at risk. We know that certain groups – including some ethnic minorities and the socially deprived – have a higher likelihood of losing sight from glaucoma. We also know that they are often underserved by our current health services. Understanding more about the barriers they face in accessing care will be our priority in order to improve the help they receive.

We are determined that more people live well and maintain sight through equitable and timely access to an effective combination of clinical care and pastoral support. Uniquely situated as the sole UK charity exclusively dedicated to glaucoma, our members are an invaluable source of insight and intelligence about what it is really like to live with the disease. They know first-hand how difficult it can be to navigate the current system, one which is highly inconsistent across the UK. As the eyecare sector grapples with the existing challenges and looks for new models of care, it is vital that we represent their voice. The growing momentum for a new national eye health strategy is a real opportunity – we must ensure that it delivers for people living with glaucoma and those who care for them.

We want to be more ambitious and creative with our research funding and to press hard for the elusive glaucoma cure. With a history of providing initial funding for glaucoma research, we are poised to expand our efforts in our anniversary year, particularly in supporting fellowships and emerging researchers. In honour of Ronald Pitts Crick, to whom we owe so much, we hope this will fuel the emergence of the next generation of pioneers in the field.

I won't be here, of course, but I do hope Glaucoma UK isn't celebrating its centenary in 50 years' time. I hope that improvements in detection and treatment mean that the need for the charity no longer exists. Now that would be cause for a party.

Author

Joanne Creighton,
Chief Executive, Glaucoma UK.

Glaucoma UK | Celebrating 50 years 1974 - 2024

Neovascular glaucoma – A review

BY SAAJAN RAMJI, SAURABH GOYAL, JAIRO TORRES, OBEDA KAILANI, ABDUS SAMAD ANSARI

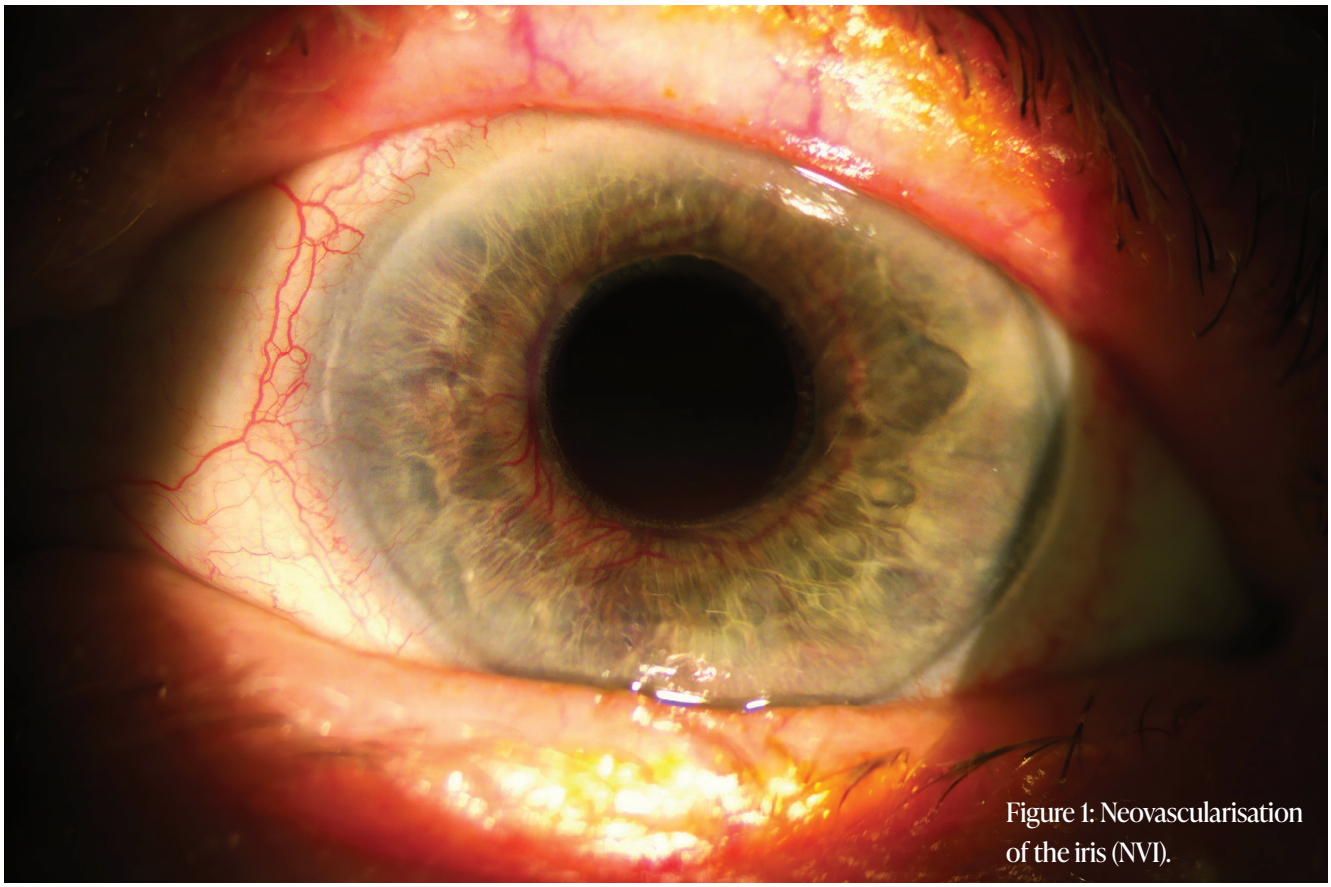


Figure 1: Neovascularisation of the iris (NVI).

Epidemiology

In 2013, it was estimated that the total worldwide prevalence of glaucoma was approximately 64.3 million and this is projected to increase to 111 million by 2040 [1]. Neovascular glaucoma (NVG) in particular affects 75,000 to 113,000 people in Europe, resulting in 3.9% of all glaucoma cases being attributed to NVG [2]. Although NVG is a relatively rare form of glaucoma, it can result in rapid progression of glaucomatous optic neuropathy, severe eye pain and irreversible blindness.

Several ocular and systemic diseases that result in retinal ischaemia can cause NVG. The three commonest causes are proliferative diabetic retinopathy (DR), central retinal vein occlusion (CRVO) and ocular ischaemic syndrome (OIS) [3]. Proliferative diabetic retinopathy has the strongest association with NVG and the literature estimates that 65% of people with proliferative DR (PDR) will have neovascularisation of the iris, 20% of which will proceed to NVG [4]. The association of NVG with common diseases such as diabetes, coupled with its aggressive, rapidly progressive nature, necessitates clear guidance for its safe and effective treatment.

Pathogenesis

In order to utilise effective treatment modalities, whether that be surgical, medical or laser, it is important that the pathogenesis of NVG is understood. In 1906, Coats demonstrated that new blood vessels grew on the surface of the iris in eyes with CRVO [5]. Approximately six decades later, Weiss, et al. (1963) coined the term 'neovascular glaucoma' to describe raised intraocular pressure (IOP) secondary to neovascularisation of the iris [6].

The main driver for neovascularisation of the iris is retinal ischaemia and hypoxia. An ischaemic retina produces factors that will stimulate the growth of new blood vessels. During ischaemia, a pathological process occurs that results in the impaired homeostatic balance of pro-angiogenic and anti-angiogenic factors. Pro-angiogenic factors include vascular endothelial growth factor (VEGF), hepatocyte growth factor, insulin-like growth factor as well as inflammatory cytokines such as interleukin-6 (IL-6). On the other hand, anti-angiogenic factors include transforming growth factor (TGF-B), thrombospondin and somatostatin [3]. A stimulus triggering the imbalance in these factors is often the cause of abnormal vessel growth or regression.

From all the pro-angiogenic factors, VEGF plays a key role in NVG. It is released by many types of retinal cells, namely retinal pigment epithelial cells, Müller cells, ganglion cells and pericytes [3]. As the concentration of VEGF increases it exerts its affects throughout the eye, including the iris. At the site of the iris, VEGF causes endothelial budding of the vasculature of the minor and major arterial circles [7]. Ultimately, this results in neovascularisation of the iris (NVI) but with leaky, porous vessels that are deficient in supportive tissue. These new vessels can form in the anterior chamber and obstruct the trabecular meshwork to cause neovascularisation in the angle (NVA). Consequently, aqueous humour is unable to drain effectively which leads to a rise in IOP. If left untreated, pressure induced optic neuropathy can ensue and culminate in irreversible blindness.

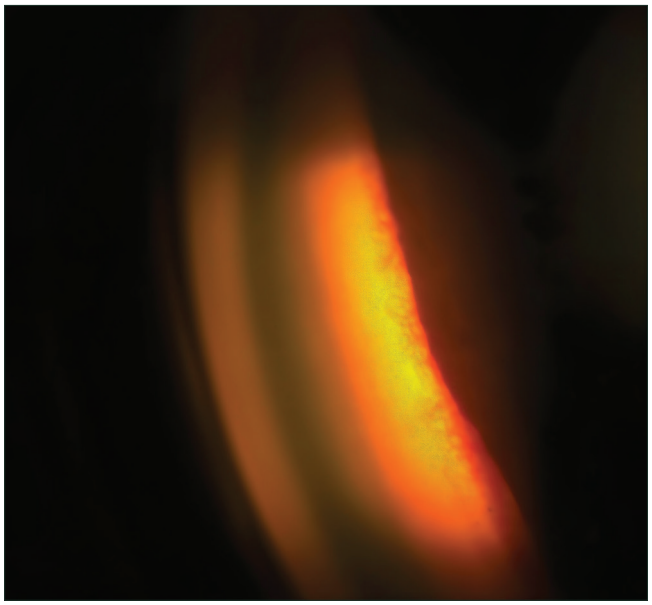


Figure 2: Neovascularisation of the angle (NVA).

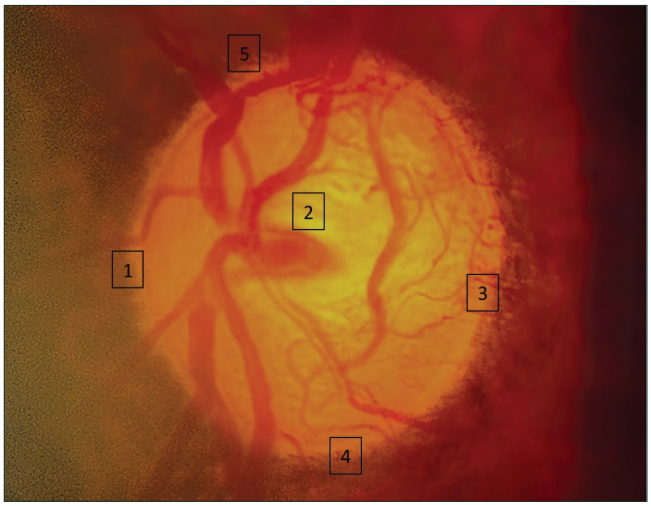


Figure 3: Optic disc of a patient with neovascular glaucoma. 1) Bayonetting of vessels; 2) Nasalisation of vessels; 3) Neovascularisation of disc; 4) 100% cup:disc ratio; 5) cicumlinear vessel.

Clinical features

Early in the disease, like other forms of glaucoma, patients may be asymptomatic. However, as the disease progresses, patients can develop painful red eyes and a reduction in visual acuity, this is often associated with raised intraocular pressure. In the presence of complete angle closure, persistent headache, nausea, vomiting and visual loss can occur [3].

Neovascularisation of the iris can be identified on slit-lamp examination whereby thin, tortuous vessels can be seen randomly orientated on the surface of the iris (Figure 1). In the early stages the vessels may not be visible on slit-lamp examination. A useful tool utilised to detect early vessel growth is iris fluorescein angiography as demonstrated by early hyperfluorescence and late leakage [8].

Neovascularisation of the angle is typically confirmed on gonioscopic assessment of the angle. These vessels also appear irregular, thin and tortuous (Figure 2) and are seen to obstruct the trabecular meshwork [4]. Similarly, in early disease, particularly in heavily pigmented irides, visualisation of the NVA can be challenging. In addition, particularly in poorly controlled advanced neovascular disease, optic disc examination can reveal neovascularisation of the disc, bayonetting and nasalisation of retinal vessels and an increased cup-disc ratio (Figure 3). It can be useful to assess the unaffected angle first to determine the normal configuration and then compare with the affected eye in unilateral cases.

Crucially, neovascularisation and the secondary optic neuropathy from raised intraocular pressure is usually in response to a stimulus, typically hypoxia or hypoperfusion of the retina. Fundus assessment and fundus fluorescein angiography are key to establish causation as treatment strategies will vary [3].

Management of neovascular glaucoma

Current management of NVG utilises the understanding of the physiological process of NVG and thus uses anti-VEGF and pan-retinal photocoagulation (PRP) to reduce the neovascular drive. Unfortunately, additional surgical interventions are often required when medical treatments do not adequately control IOP. There is, however, no evidence-based consensus for the current treatment of NVG.

Our team, based at King's College Hospital NHS Trust, recently carried out a systematic review and meta-analysis to determine the safety and efficacy of current treatment modalities for NVG [9]. This review included human studies over the past 21 years which only investigated patients with a confirmed diagnosis of NVG. A total of 14 studies were included that analysed a variety of medical, surgical and laser treatments. The outcomes reported were success rate, complications, mean IOP and mean IOP lowering medications.

Medical, surgical and laser treatments

Two studies used in the meta-analysis compared IOP at six and 12 months, as well as the odds of success for Ahmed glaucoma valve (AGV) + PRP vs. AGV + PRP + intravitreal bevacizumab (IVB) [10,11]. For mean IOP at six and 12 months, the mean difference between AGV + PRP and AGV + PRP + IVB was 5.90mmHg (95% CI -6.30, 18.10, p=0.34) and 5.29 (95% CI -7.84, 18.42, p=0.43) respectively. No difference in success rates between these two interventions was identified. Only one study reported mean IOP lowering medications and the number was found to be significantly lower at 18 months' follow-up; 1.67 ± 0.65 for AGV + PRP vs. 1.14 ± 0.69, for AGV + PRP + IVB (p=0.0002) [10].

For studies that investigated the efficacy and safety of anti-VEGF treatments, only one study showed lower mean IOP at both one month (21.8 ± 13.7 vs. 34.9 ± 15.2, p =0.002) and three months (25.1 ± 20 vs. 35.2 ± 10.7, p=0.033) for IVB vs. sham injection [12]. The other three studies which compared intravitreal aflibercept (IVA) vs. sham injection, PRP vs. PRP + IVB and trabeculectomy (Trab) + PRP + intravitreal conbercept (IVC) vs. Trab + PRP + intravitreal ranibizumab (IVR) demonstrated no significant difference in mean IOP [13-15]. The same was true for mean IOP lowering medications.

From the two studies that compared transscleral diode laser (TDL) with the AGV and Express Implant, the success rates were 63% for TDL vs. 42% for AGV (p=0.65) and 44.44% for TDL vs. 50% for Express Implant [16,17]. No statistically significant differences between success rates were found due to small study numbers and similarly, there was no significant difference in mean IOP and mean IOP lowering medications.

The main findings from the four studies that compared Trab with other interventions were significantly lower mean IOP at six months (16.5 ± 1.4 vs. 17.52 ± 0.8, p=0.001), nine months (18 ± 1.5mmHg vs. 17.19 ± 1.6mmHg, p=0.01), 12 months (17.76 ± 2 vs. 18.76 ± 1.7, p=0.02) and 18 months (18.19 ± 2.0 vs. 19.92 ± 2.6, p =0.004) for IVR + PRP + visco-trabeculectomy (Vtrab) vs. IVR + PRP + Trab, as well as lower mean IOP at six months (11.7 ± 5.

vs. 16.2 ± 7.5, p=0.03) for the Baerveldt implant vs. Trab [18,19]. Success rates for the IVR + PRP + Vtrab vs. IVR + PRP + Trab study were 53.8% vs. 52%, and for the Baerveldt vs. Trab study were 59.1 % vs. 61.6%. Although these two studies showed significant differences in mean IOP between study groups, there was no difference in success rates.

In the two studies investigating AGV, the only significant finding was a lower mean IOP of 13.6 ± 6.5 at one month in the AGV + Triamcinolone (TCA) group vs. 20.4 ± 9.7 for AGV alone [20].

Discussion

This is the only systematic review studying NVG to use solely randomised controlled trials (RCTs).

The first point of note is that there was large heterogeneity between studies in terms of the definition of success and the outcomes reported. This led to the data from only two studies being used in the meta-analysis. The other 12 studies were compared with a narrative synthesis.

Previous systematic reviews on this topic have included a mixture of study types. Shchomak and colleagues who conducted a systematic review and meta-analysis on surgical treatments for NVG included lower-level evidence. Their findings demonstrated that glaucoma drainage devices and cyclophotocoagulation had similar IOP lowering efficacy, cyclophotocoagulation had greater rates of failure and AGV had greater IOP lowering ability when compared with Trab, but a higher failure rate [21].

Other reviews have looked at outcomes comparing AGV with and without IVB [22,23]. We included one study that compared AGV with and without IVB – this study showed no mean difference in IOP as well as similar success rates between both groups. These results were different to those reported by the aforementioned systematic reviews as they reported greater success rates in the AGV + IVB groups.

One of the main issues with the current literature, highlighted by this review, is that there is a lack of well-constructed RCTs in the management of NVG. For example, the RCTs included by us to investigate the utilisation of anti-VEGF, highlight that anti-VEGF can result in lower mean IOP but no meta-analysis could be carried out. This is further supported by a Cochrane review in 2020 which included four studies in their analysis of anti-VEGF treatment for NVG. The authors of this study were only able to perform a narrative synthesis and no meta-analysis due to the lack of RCTs, the lack of reporting of desired outcomes such as success rate and incomplete data (standard deviation, p-values) [24].

Conclusion

There is paucity of high-level evidence in the form of RCTs in the management of NVG. In addition, the lack of long-term follow-up and large heterogeneity between studies in terms of outcomes reported and definition of success. To accurately compare studies and derive conclusions a universal NVG core outcome set is required, which clearly defines success, as well as mandatory outcomes measures such as mean IOP, IOP lowering medications and complications as well as visual outcomes.

With the current data in the literature, it is not possible to accurately state the optimal surgical or medical treatment for NVG. Aqueous shunts or cyclodiode photocoagulation remain the mainstay of treatment in conjunction with neovascular drive attenuation. There is still a need for RCTs comparing treatment modalities for NVG for both IOP control and angiogenic suppression. A systematic approach to research into NVG is key. A consensus on common treatment modalities to be studied by RCT and a centralised registry for case analysis may be one solution to move quality research on this topic in the right direction.

TAKE HOME MESSAGE

- NVG is a rare form of glaucoma. It can be caused by a number of ocular and systemic diseases. The three main causes are proliferative diabetic retinopathy, central retinal vein occlusion and ocular ischaemic syndrome.
- NVG is an aggressive form of glaucoma and can be difficult to treat effectively. Current treatment aims to inhibit the neovascular drive and implement additional intraocular lowering treatments if necessary.
- A recent systematic review and meta-analysis of RCTs investigating different treatment modalities for NVG showed VEGF suppression and shunt-based procedure would be beneficial to those requiring surgical intervention, with cyclodiode therapy used as an alternative adjunct.
- However, there was absence of consensus and variability of evidence due to heterogeneity between studies. Many RCTs do not report all the outcomes required to assess efficacy and safety of different treatments.
- There is significant paucity of well-constructed RCTs in the management of NVG and therefore a greater number of well-designed RCTs are needed to determine the safest and most efficacious treatments for NVG.
- A multi-centred, centralised approach to case reporting and registration may provide a more feasible approach to recruitment.

Scan the QR code to read the references for this article.

We thank the patient involved for kindly consenting to use their image in this article.

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TOPCON Healthcare

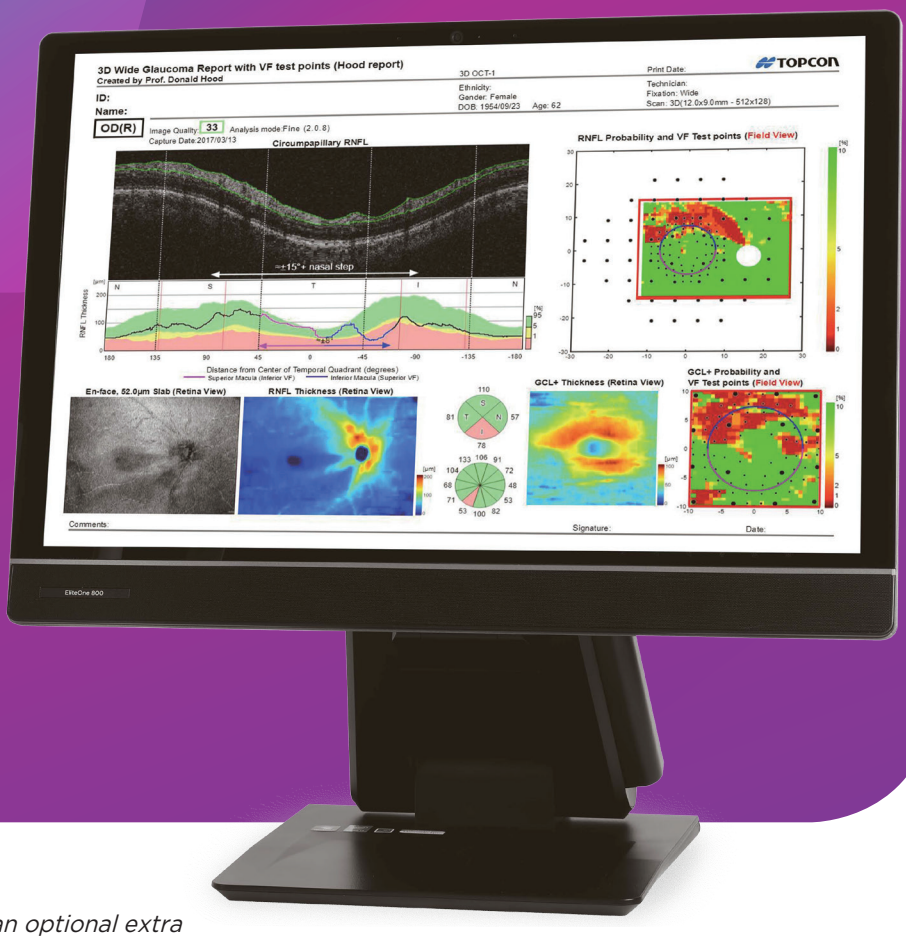
Topcon's OCTs with the Hood report for Glaucoma, the perfect combination

DRI OCT Triton
Swept Source OCT/OCT-A*

Maestro2
Automated OCT/OCT-A*

Hood Report (for Glaucoma)

Retinal Thickness/RNFL/GCL and Optic Nerve Metrics in a single scan. This report streamlines the decision-making process through the correlation of structure (GCC/RNFL) with function (overlay of visual field test locations)[1]



**OCT-A is available as an optional extra*

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[1]Zhichao Wu, Denis S. D. Weng, Rashmi Rajshekhar, Abinaya Thenappan, Robert Ritch, Donald C. Hood. Evaluation of a Qualitative Approach for Detecting Glaucomatous Progression Using Wide-Field Optical Coherence Tomography Scans. Trans Vis Sci Tech. 2018;7(3):5.

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Team roles in glaucoma care

BY LYNNE HADLEY, JULIAT BURNS, EMMA COLEMAN, SCOTT JONES

There is variation in the way eye health teams deliver glaucoma care. Technicians' roles differ significantly and there is no single standard that describes team roles by band. Teams include ophthalmologists, ophthalmic nurses and technicians. Optometrists are also increasingly included in glaucoma clinics and physician assistants are now specialising in ophthalmology and glaucoma care, too.

It is an exciting time for people wishing to subspecialise in glaucoma care as there are many opportunities to develop and progress. Lynne Hadley, President of The Association of Ophthalmic Nurses and Technicians (AONT) says: "For nurses, the sky is the limit! Glaucoma is a lifelong condition that can be entirely nurse-led, with ophthalmologist input. Stable glaucoma patients may never need to see a doctor again, after diagnosis."

The Ophthalmic Practitioner Training (OPT) Programme includes Glaucoma as one of its four clinical areas, and describes three levels of competency:

1. Checking vision
2. Working to protocols
3. Advanced Clinical Practice (ACP).

Progression in glaucoma competencies means eye health teams will configure themselves differently, dependent on skills mix. There is no single glaucoma clinic staffing model, a situation AONT is seeking to clarify by sharing evidence and best practice amongst colleagues.

The ophthalmic nurse

Preliminary investigations are carried out by the nurse so that ophthalmologists can assess the health of the eye. Nurses assess and record the visual acuity and monitor the intraocular pressure before handing the patient onto the technician. Band-5 nurses may take on additional tasks such as history taking. As nurses progress through OPT they may also use slit-lamps and assess the angle of the eye. ACPs may also monitor patients as a case load.

The ophthalmic technician

Technicians carry-out many of the diagnostic tests that support diagnosis, for example, optical coherence tomography (OCT) imaging of the retina and optic disc and visual field testing. They analyse the results and escalate to a clinician or nurse in a timely manner if they have concerns. Technicians may also measure intraocular pressure.

Eye Clinic Liaison Officers (ECLO)

ECLOs remind patients of the importance of eye drop compliance, ensuring that they're managing to instil drops correctly, and if necessary, teaching simple techniques to improve this. They also advise on the availability and use of eye drop dispensers. Some ECLOs work in collaboration with Glaucoma UK to provide a comprehensive support system to patients.

For more information

AONT is an independent, apolitical, professional network of ophthalmic nurses, nursing associates and technicians practicing in the UK and Ireland.

www.aont.org.uk

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Industry News

DSLT. How efficient is it?

Ophthalmology is currently the busiest outpatient specialty in secondary care and makes up almost 10% of the entire NHS waiting list. According to NHS data, as of March 2023, over 650,000 patients were on the waiting list for treatment. The Royal College of Ophthalmologists anticipates a 44% increase in demand for glaucoma services by 2035. Improving care pathways is essential, with innovative technology needed to help reduce waiting times and avoid physician burnout.

In January 2022, NICE published guidance which set the standard for laser therapy as a first-line treatment. Addressing the challenges of conventional SLT and helping meet the need for additional alternatives, BELKIN Vision has developed the Eagle™. The device is a novel, non-contact Direct-SLT platform that automatically directs laser energy to the trabecular meshwork through the limbus and perilimbal sclera. DSLT offers a more accessible first-line and later-stage glaucoma treatment, easing patient waiting lists and expanding access to significantly more eyecare providers closer to the point of diagnosis.

At the 2023 World Glaucoma Congress in Rome, Lai-Yeung Ngai of the National Treatment Centre in Inverness, Scotland presented bilateral treatment times for her first eight patients using the Eagle device. Her results showed that the first patients took only 7-8 minutes to treat, and by patient six treatment times had already dropped to 3-4 minutes. In an interview about the March 2023 trial following the presentation, she explained that even while learning to use the device and counselling and moving patients through appointments, they were able to treat 18 eyes in 10 patients in about 3 hours.

Consultant ophthalmologist Sheraz Daya shared a very similar experience at ESCRS, stating that: "in the time that it takes me to do one SLT treatment, I can do four DSLT treatments."

Now that laser therapy is widely recognised as the recommended first-line treatment of choice for glaucoma patients, patient clinics that add DSLT to their practice may considerably improve efficiency and access to care, to become a resource that tackles one of the biggest issues today not only in the UK but for glaucoma worldwide.

Exclusive glaucoma products from Altomed

Altomed is the UKs largest independent ophthalmic surgical supplier covering all subspecialities including glaucoma.

Alongside their extensive range of stainless steel and titanium reusable instruments, they are the exclusive UK distributor for New World Medical products including the KDB Glide®, Ahmed® Glaucoma Valve and Ahmed ClearPath®.

The Ahmed ClearPath® is a next generation valveless glaucoma implant which makes surgery easier, safer, and faster than conventional valveless tubes and is available in two sizes: 250mm and 350mm. The 250mn model is sufficiently small it fits conveniently between the rectus muscles.

The KDB Glide® is an improved version of the original Kahook Dual Blade and enables an excisional goniotomy to be performed and is arguably the most cost-effective MIGS surgery option available and is suitable for both open and closed angle surgeries.

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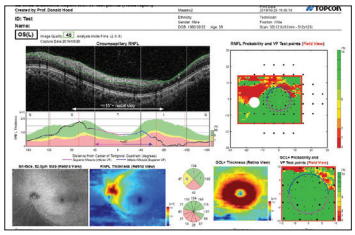
Topcon's OCTs include the Hood Report for Glaucoma



Both the Topcon Maestro2 and Triton OCTs offer valuable tools for clinicians to diagnose, monitor and manage glaucoma, and treatment efficacy, including the Hood report for Glaucoma developed in collaboration with Professor Donald C. Hood. Our world-class OCT systems gather comprehensive data relating to retinal nerve fibre layer (RNFL) and ganglion cell layer (GCL) thickness and use this to present probability maps of visual field test locations to assess the functional damage caused by glaucoma. The report includes:

- OCT B-Scan of Circumpapillary RNFL (cpRNFL) with Reference Database
- Wide Field OCT Enface Image (12 x 9mm area)
- Wide Field RNFL Thickness Map (12 x 9mm area)
- Correlation of both OCT RNFL and GCL+IPL Data (Structure) with Visual Field Test Locations (Function)
- cpRNFL Thickness 4 Sectors and 12 Clock Hours with Reference Database
- GCL+ IPL Thickness Map - a colour-coded map of GCL+IPL thickness surrounding the fovea.

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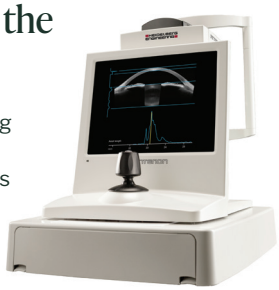
Multimodal imaging platform optimised for the anterior segment



ANTERION® utilises the power of high-resolution swept-source OCT images to provide the most important anterior segment examinations and measurements in one modular, upgradeable platform.

The result: a single workflow-efficient solution that brings together corneal topography and tomography, anterior segment metrics, axial length measurement and IOL calculation to transform the day-to-day routines in cataract and refractive surgery as well as cornea and glaucoma diagnostics.

ANTERION delivers high-quality images and comprehensive measurements while minimising the time needed to perform multiple anterior segment examinations. The fast acquisition time with multiple examinations being undertaken on the same device allows for a streamlined workflow. At the same time, visual confirmation of all measurements with high-resolution swept-source OCT images provides diagnostic confidence.

Manage multiple diagnostic images with the flexibility and power of the HEYEX 2 image management and device integration platform.

For more information on ANTERION please visit **www.HeidelbergEngineering.co.uk**

Keeler launches new website and announces enhancements to its slit-lamps

Keeler, global suppliers of ophthalmic instruments, has launched a brand new website, created with its customers in mind. Designed to be a global resource for everyone, including students, distributors and key regions, the new website is tailored to you, making it easier to fulfil your optometry needs.

Keeler's slit-lamps have also had a refresh. In collaboration with clinicians, Keeler have delivered enhancements to improve yours and your patient's experience. Keeler's digital imaging software, Keeler Konnect, now comes with DICOM capabilities, so you can integrate your slit-lamp into your patient management system, simplifying your admin process. The slit aperture on its range has also increased to 14mm, making a larger area of the retina visually accessible. Made with a finer slit width diaphragm scale, you can now precisely measure pathologies with even smaller increments. Discover more of Keeler's exciting evolutions at:

www.keelerglobal.com

Implant-free MIGS with OMNI at UKEGS

Sight Sciences are excited to attend the 2023 UK and Éire Glaucoma Society (UKEGS) meeting, to be held in London from Wednesday 22 to Thursday 23 November.

At the Sight Sciences booth attendees will have the opportunity to engage in peer-to-peer discussions with other glaucoma specialists and participate in hands-on demonstrations with the OMNI Surgical System - an implant-free MIGS procedure that uniquely addresses all three known points of resistance in the aqueous outflow system: the trabecular meshwork, Schlemm's canal and the collector channels.

In addition, the Sight Sciences team will be on-hand to share recent clinical publications, discuss the growing strength of real-world evidence around canaloplasty and trabeculotomy and give tips and pearls on surgical technique and patient selection.

https://OMNIsurgical.com

Mainline Instruments and LKC Technologies partner to expand access to advanced ophthalmic and visual electrophysiology solutions

Mainline Instruments, a distinguished distributor of ophthalmic devices in the UK, is excited to announce its strategic partnership with LKC Technologies, a global leader in the production of visual electrophysiology products. This collaboration is poised to enhance the availability of cutting-edge ophthalmic solutions and elevate the standard of visual diagnostics and research across the United Kingdom.

LKC Technologies has built a reputation for developing groundbreaking visual electrophysiology products that play a pivotal role in helping to diagnose and monitor ocular and neurological conditions with precision. Their innovative portfolio includes the renowned RETeval™® series, which offers reliable and accurate assessments of retinal function.

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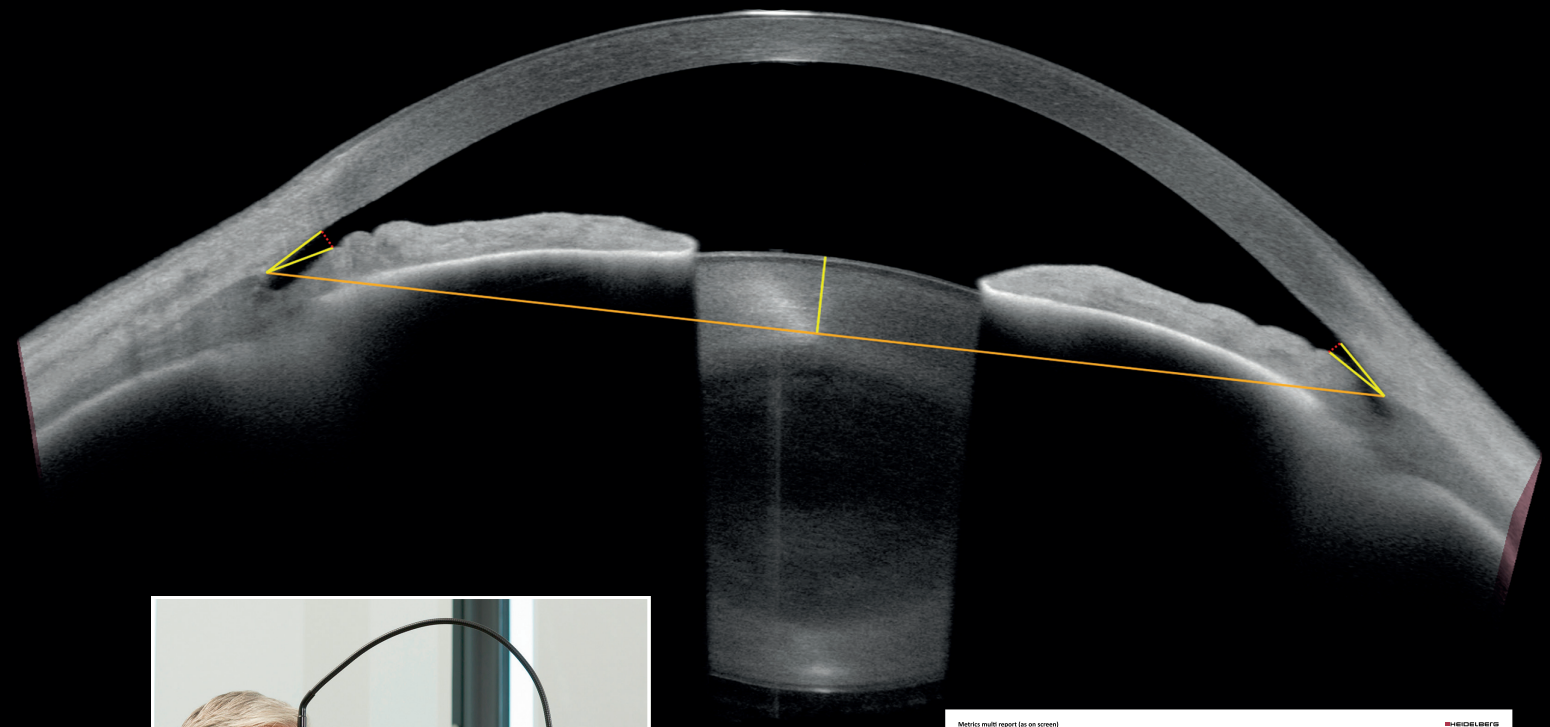
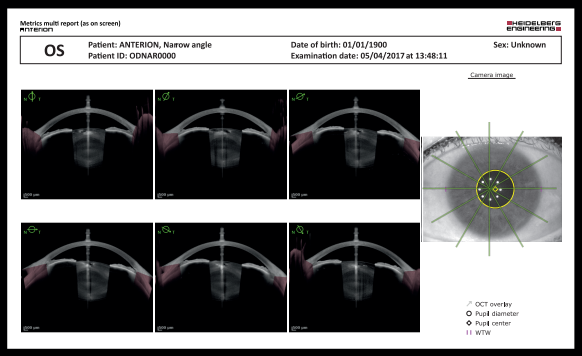
Advanced Glaucoma Metrics for every patient





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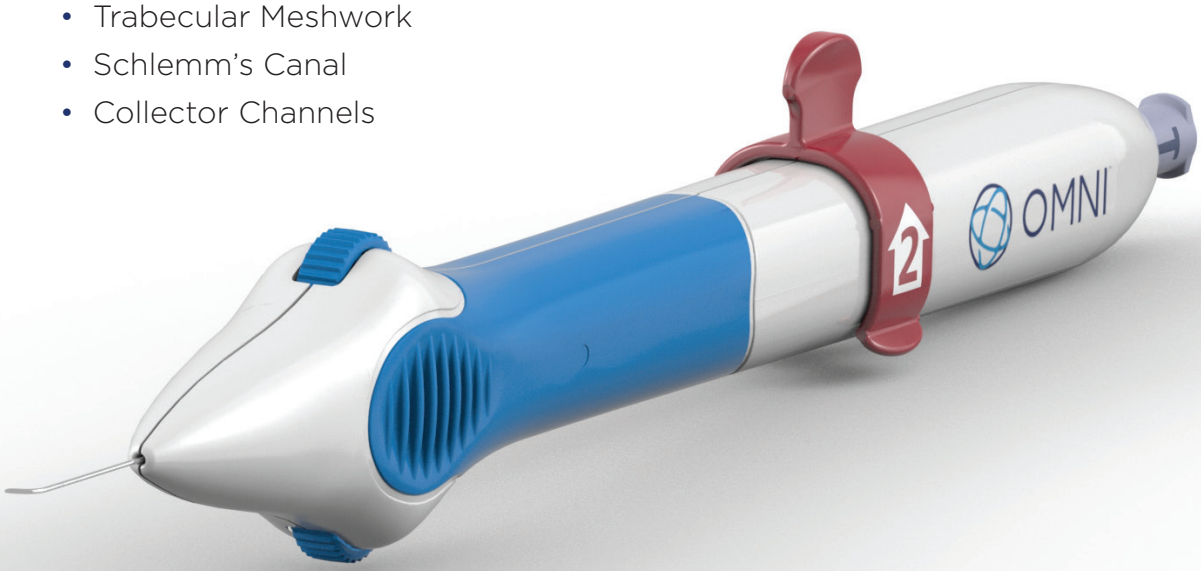

LEARN MORE AT
OMNISURGICAL.UK

IMPORTANT PRODUCT INFORMATION

INDICATIONS FOR USE: The OMNI® Surgical System is indicated for the catheterization and transluminal viscodilation of Schlemm's canal and the cutting of trabecular meshwork to reduce intraocular pressure in adult patients with open-angle glaucoma.

CONTRAINDICATIONS: Do not use the OMNI® in any situations where the angle is compromised or has been damaged (e.g., from trauma or surgery), since it may not be possible to visualize the angle or to properly pass the microcatheter. Do not use the OMNI® in patients with angle recession; neovascular glaucoma; chronic angle closure; narrow-angle glaucoma; traumatic or malignant glaucoma; or narrow inlet canals with plateau iris.

Please refer to the full Instructions For Use, available at OMNIsurgical.com/international, for warnings, precautions, and adverse event information.

10/22 CE2797 OM-2602-OUS.v1

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