



PRESS RELEASE

NUHS clinician-scientists develop new glaucoma implant that reduces eye pressure, preserves vision

Singapore, 12 Nov 2021 – Glaucoma affects about three to five per cent of the elderly population in Singapore, and the risk increases with age. The non-surgical treatment options available for most patients are medications to reduce pressure in the eye and laser trabeculoplasty, which targets the drainage angle of the eye.

Although the use of minimally invasive glaucoma surgery has become popular, many patients with advanced glaucoma or complex secondary glaucoma are not suitable for such procedures. In these circumstances, trabeculectomy is a reasonable option but it is effective largely in carefully selected patients without significant risk factors for surgical failure.

On the other hand, aqueous tube shunts have a much broader range of efficacy, working to some degree even in patients with the highest risk of failure. Choosing the appropriate treatments and tube shunts requires in-depth understanding of each patient's condition and surgical requirements – tube shunt implants are versatile and effective for most types of glaucoma even in severe ones like refractory glaucoma.

A new glaucoma implant developed by a National University Health System team reduces patients' eye pressure (also known as intraocular pressure, IOP) for a longer period of time and enables less reliance on eye drops. The Paul Glaucoma Implant (PGI) is a glaucoma drainage device which regulates IOP and prevents further progression of the disease that leads to blindness.

With a higher efficacy and safety profile in reducing IOP, this medical technology innovation advances the treatment of glaucoma. In patients with medically uncontrolled glaucoma, the PGI offers a viable option in the management of refractory glaucoma, a severe form of glaucoma that has a high risk of failure from conventional trabeculectomy surgery.

Led by Professor Paul Chew from the Yong Loo Lin School of Medicine, National University of Singapore (NUS Medicine) and Senior Consultant at the Department of Ophthalmology, National University Hospital (NUH), the research team involved in the development and design of the implant comprises Adjunct Associate Professor Chelvin Sng, NUS Medicine, Visiting Consultant from the Department of Ophthalmology, NUH, and Medical Director, Chelvin Sng Eye Centre, as well as researchers at the National University of Singapore.

“We designed this implant to give higher successful eye pressure control and consistent safety and efficacy. It is a more reliable device than current standard devices in use today. The ability to predictably manage severe glaucoma is the result of this new implant,” said Professor Chew.

Manufactured using medical grade silicone, the implant has two distinguishing features – a smaller tube calibre compared to other similar tube shunts, and an end-plate optimised to have a larger effective surface area. Co-inventor of the implant, Associate Professor Chelvin Sng, emphasised, “The implant has undergone rigorous safety and biocompatibility studies in the laboratory and in animal studies before being implanted in patients.”

A clinical trial with the PGI conducted in December 2017 to 2018 led by Associate Professor Victor Koh, Head, Department of Ophthalmology in NUS Medicine and NUH, has shown that surgery with the implant has successfully reduced the eye pressure in 93 per cent of its participants after a one-year follow up. The results also suggested that it is effective, safe and the dependency on anti-glaucoma eye drops after surgery is much less compared to published reports for other implants. The results of the trial were published in *Ophthalmology Glaucoma* on 11 May 2020 and 74 patients from Singapore, United Kingdom, Thailand, Hong Kong and Malaysia were recruited for follow-ups.

"The clinical outcomes from the multi-centre study validated the novel design of the PGI. Compared to published outcomes of other glaucoma tube shunts, the study suggests that the PGI is able to optimise eye pressures for refractory glaucoma with lower dependency on anti-glaucoma eye drops," said Associate Professor Victor Koh.

The implant is licensed to a start-up company Advanced Ophthalmic Innovations Pte Ltd (AOI) and has been used for glaucoma treatments in Singapore, Europe, South Africa, Middle-east, and Asia-Pacific. The innovation team received the Conformité Européenne (CE) Mark and Health Sciences Authority (HSA) approval for the Paul[®] Glaucoma Implant in 2017, and Therapeutic Goods Administration (TGA) certification was obtained in 2018. AOI recently commenced clinical trials in China in order to secure the National Medical Products Administration (NMPA) approval for clinical sales in China. Further, AOI also plans to undertake the US FDA regulatory filing soon. Patents were granted in the US, China, Singapore, and Japan.

The implants are now used by leading hospitals and established eye centres in the United Kingdom, Ireland, Germany, Holland, Finland, Italy, Portugal, France, Spain, Belgium, Saudi Arabia, South Africa, South Korea, Malaysia, Australia and New Zealand as well as the National University Hospital here.

"An important aim that we have achieved with the Paul Glaucoma Implant is to design a shunt that is less invasive inside the eye, with its much smaller tube than conventional implants, without compromising efficacy across the spectrum of recalcitrant glaucomas," added Professor Keith Barton, a glaucoma specialist with Moorfields Eye Hospital in the United Kingdom and a visiting Professor with NUS Medicine. He was also involved in the design phase of the PGI.

Professor Lee Tian Tee, a Singaporean music professor at the Sichuan Conservatory of Music, received the implants at the National University Hospital in 2018 and 2019. "I had gone for an eye check-up in 2016 to seek help for my cataract. It was then that I found out that I was also suffering from glaucoma. After a detailed assessment with Prof Chew, who was my eye doctor, I received the Paul Glaucoma Implant (PGI) on both eyes. It has substantially relieved the pressure in my eyes without the need for any eye drop medication."

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About the National University of Singapore (NUS)

The National University of Singapore (NUS) is Singapore's flagship university, which offers a global approach to education, research and entrepreneurship, with a focus on Asian perspectives and expertise. We have 17 faculties across three campuses in Singapore, with more than 40,000 students from 100 countries enriching our vibrant and diverse campus community. We have also established our NUS Overseas Colleges programme in more than 15 cities around the world.

Our multidisciplinary and real-world approach to education, research and entrepreneurship enables us to work closely with industry, governments and academia to address crucial and complex issues relevant to Asia and the world. Researchers in our faculties, 30 university-level research institutes, research centres of excellence and corporate labs focus on themes that include energy; environmental and urban sustainability; treatment and prevention of diseases; active ageing; advanced materials; risk management and resilience of financial systems; Asian studies; and Smart Nation capabilities such as artificial intelligence, data science, operations research and cybersecurity.

For more information on NUS, please visit www.nus.edu.sg

About the NUS Yong Loo Lin School of Medicine (NUS Medicine)

The NUS Yong Loo Lin School of Medicine is Singapore's first and largest medical school. Our enduring mission centres on nurturing highly competent, values-driven and inspired healthcare professionals to transform the practice of medicine and improve health around the world.

Through a dynamic and future-oriented five-year curriculum that is inter-disciplinary and inter-professional in nature, our students undergo a holistic learning experience that exposes them to multiple facets of healthcare and prepares them to become visionary leaders and compassionate doctors and nurses of tomorrow. Since the School's founding in 1905, more than 12,000 graduates have passed through our doors.

In our pursuit of health for all, our strategic research programmes focus on innovative, cutting-edge biomedical research with collaborators around the world to deliver high impact solutions to benefit human lives.

The School is the oldest institution of higher learning in the National University of Singapore and a founding institutional member of the National University Health System. It is Asia's leading medical school and ranks among the best in the world (Times Higher Education World University Rankings 2022 by subject and the Quacquarelli Symonds (QS) World University Rankings by subject 2021).

For more information about NUS Medicine, please visit <https://medicine.nus.edu.sg/>

About the National University Hospital (NUH)

The National University Hospital is a tertiary hospital and major referral centre with over 50 medical, surgical and dental specialties, offering a comprehensive suite of specialist care for adults, women and children. It is the only public hospital in Singapore to offer a paediatric kidney and liver transplant programme, in addition to kidney, liver and pancreas transplantation for adults.

The hospital was opened on 24 June 1985 as Singapore's first restructured hospital. Each year, the Hospital attends to more than one million patients.

As an academic health institution, patient safety and good clinical outcomes are the focus of the Hospital. It plays a key role in the training of doctors, nurses, allied health and other healthcare professionals. Translational research is pivotal in the Hospital's three-pronged focus, and paves the way for new cures and treatment.

A member of the National University Health System, it is the principal teaching hospital of the NUS Yong Loo Lin School of Medicine and the NUS Faculty of Dentistry.

About the National University Health System (NUHS)

The National University Health System (NUHS) aims to transform how illness is prevented and managed by discovering causes of disease, development of more effective treatments through collaborative multidisciplinary research and clinical trials, and creation of better technologies and care delivery systems in partnership with others who share the same values and vision.

Institutions in the NUHS Group include the National University Hospital, Ng Teng Fong General Hospital, Jurong Community Hospital and Alexandra Hospital; three National Specialty Centres - National University Cancer Institute, Singapore (NCIS), National University Heart Centre, Singapore (NUHCS) and National University Centre for Oral Health, Singapore (NUCOHS); the National University Polyclinics (NUP); Jurong Medical Centre; and three NUS health sciences schools – NUS Yong Loo Lin School of Medicine (including the Alice Lee Centre for Nursing Studies), NUS Faculty of Dentistry and NUS Saw Swee Hock School of Public Health.

With member institutions under a common governance structure, NUHS creates synergies for the advancement of health by integrating patient care, health science education and biomedical research.

As a Regional Health System, NUHS works closely with health and social care partners across Singapore to develop and implement programmes that contribute to a healthy and engaged population in the Western part of Singapore.

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