

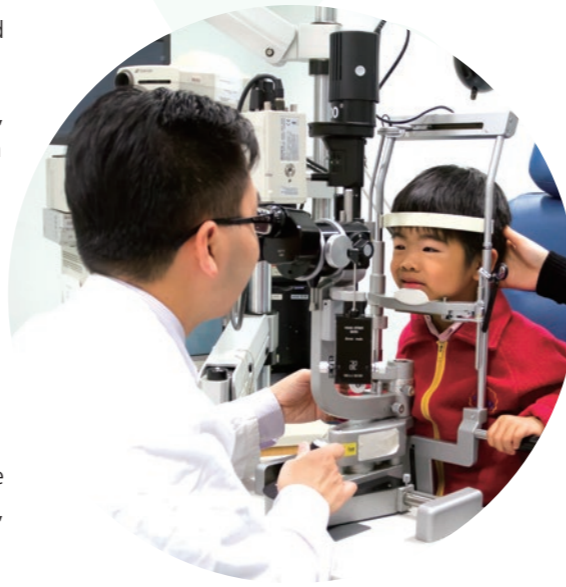
Paediatric Ophthalmology & Squint Surgery, Childhood Myopia

The Department is committed to the advancement of Paediatric Ophthalmology and Strabismus research.

Myopia is a public health threat worldwide. In one of our recent research projects, we completed a population based study, the Hong Kong Children Eye Study, in which we examined 3,000 children age 6-8 years for the prevalence of myopia and other eye diseases in Hong Kong. We also launched The CUHK Jockey Club Children Eye Care Programme with funding of HK\$44 million from the Jockey Club Charities Trust, enabling us to serve 30,000 children and their families. To evaluate the effect of low dose atropine in retarding myopia progression in Hong Kong, we were awarded a HK\$900,000 General Research Fund grant by the University Grants Committee.

We are the only tertiary centre managing all retinoblastoma cases in Hong Kong. With the support of the Children's Cancer Foundation, we launched a citywide programme, the Hong Kong Retinoblastoma Awareness and Education Campaign, to increase awareness of this eye disease.

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Ophthalmic Gene Functions

Recent research has identified the genetic basis of many ophthalmic diseases. It is important to understand the functions of these genes in order to decipher the disease mechanisms and develop novel treatments. In one research programme, our team identified a family with multiple members showing corneal opacity. All affected members shared the same DNA mutation in a gene related to genome stability. Our goal with this research is to characterise the gene functions in order to understand the disease mechanism of corneal opacity.

In addition, our research team recently developed an animal model to study autoimmune inflammation in eyes. Having shown a disease outcome similar to human uveitis with this model, we are using it to screen potential reagents that could be developed into a uveitis treatment. Furthermore, we recently showed that inhibiting a growth hormone pathway can restrict the cell growth of retinoblastoma. These findings open a door to alternative treatments for retinoblastoma that could preserve people's vision.

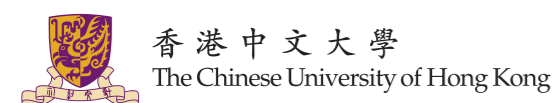
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Vitreoretinal Diseases and Management

The retina, located at the back of the eye, contains specialised cells and tissues that are vital to vision. Age-related macular degeneration (AMD) and diabetic retinopathy (DR) are retinal diseases that are among the leading causes of blindness. Asians are particularly susceptible to particular retinal disorders, including polypoidal choroidal vasculopathy (PCV) and central serous chorioretinopathy (CSCR). Our retinal research team comprises dedicated scientists and clinicians with expertise in basic, translational and clinical research in genetics, pathogenesis, electrophysiology, imaging and treatment of vitreoretinal disorders. Among our achievements, we have discovered novel gene polymorphisms in our Asian AMD and PCV patient cohort, identified potential therapeutic target proteins in retinal and choroidal angiogenesis, developed the first multi-contact, pre-amplified electroretinography recording electrode, characterised retinal and macular disease phenotypes with cutting edge imaging techniques, and pioneered effective treatment of retinal diseases with minimally invasive laser therapies.

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Ophthalmology & Visual Sciences

The Department of Ophthalmology & Visual Sciences (DOVS), established in 1994, is the first academic ophthalmology department in Hong Kong.

DOVS consists of two main functional units: The CUHK Eye Centre, which is the clinical arm of the Department; while The CUHK Ophthalmic Research Centre serves as the research arm.

DOVS staff work closely with Hospital Authority colleagues at the Hong Kong Eye Hospital, the Prince of Wales Hospital, the Queen Elizabeth Hospital, and the Alice Ho Miu Ling Nethersole Hospital. In collaboration with these hospitals, DOVS provides comprehensive secondary and tertiary ophthalmic care to about 40% of the population of Hong Kong. We also provide a full range of subspecialty-based services for cornea and external eye diseases, cataract and lens diseases, refractive surgery, glaucoma, macular and retinal diseases, immunologic eye diseases, neuro-ophthalmology, ocular oncology and pathology, paediatric ophthalmology and squint surgery, as well as orbital and oculoplastic surgeries.

DEPARTMENT OF OPHTHALMOLOGY & VISUAL SCIENCES

“Our Department aims to become one of the world's foremost centres of excellence in clinical ophthalmology and the visual sciences through world-class training and educational programmes, high-impact research, and state-of-the-art clinical ophthalmic services. We are achieving these objectives through close collaboration with our colleagues at the Hong Kong Eye Hospital, Prince of Wales Hospital, and the Joint Shantou International Eye Center, as well as with our international work partners.”

Clement Chee Yung THAM
Chairman



Medication Safety, Cost-Effectiveness and Ocular Hypertension

We have established a safe, protocol-based system of taking patients with low to moderate risk of ocular hypertension (OHT) off medications. In a study we conducted, it was found that the majority of OHT subjects who had received intraocular pressure (IOP) lowering therapy could be taken off medication safely for at least one year without progressing to primary open angle glaucoma (POAG). This avoided unnecessary medication side effects and realised substantial savings in glaucoma medications. The project received The Best Poster award at a Hospital Authority convention.

We are now extending this practice to patients with primary angle closure suspect (PACS) and primary angle closure (PAC). We also have a research interest in the cost-effectiveness of glaucoma treatment, the risk profile variability assessment of OHT (especially in the Asian population), new glaucoma surgical techniques, and the potential application of artificial intelligence in glaucoma.

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Glaucoma and its Management, Lens Surgery

The Department has established argon laser peripheral iridoplasty (ALPI) as a safe and effective first-line intervention for acute primary angle closure glaucoma (PACG). ALPI has since been widely adopted as the first-line treatment for acute glaucoma. In a more recent clinical trial, we confirmed that early lens extraction was more effective than conventional laser peripheral iridotomy in preventing the progression to chronic disease after acute glaucoma. Our randomised clinical trials also documented the efficacy and safety of lens extraction in PACG eyes, thus establishing a role for lens extraction in the management of PACG.

Our group has additional research interests in other surgical interventions in PACG eyes, including laser peripheral iridotomy and iridoplasty, trabeculectomy (penetrating, non-penetrating, carbon dioxide laser-assisted), goniosynechialysis (GSL), glaucoma implant surgery, and laser cyclodestructive procedures (trans-scleral and endoscopic), as well as various combinations of the above. We also have ongoing research programmes in diurnal intraocular pressure (IOP) profiles in PACG eyes, the impact of different treatments on IOP fluctuations, and the genetic basis of PACG.

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Retinal Imaging

The retina offers a unique and easily accessible window for studying human circulation and the nervous system. Our recent work includes the development and application of image analysis techniques for early detection of eye and brain diseases. We have also conducted a number of major studies testing the validity of different automated computer programmes to perform an objective and quantitative assessment of a new class of retinal vascular and optic nerve parameters for evaluation of diabetic retinopathy, glaucoma, and Alzheimer's disease. Currently, we are developing a more targeted and effective screening strategy using state-of-the-art retinal imaging technology for the prevention of blindness and early detection of brain diseases. This strategy has immense potential and could produce dramatic benefits for both science and society.

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Orbital and Oculoplastic Diseases

Our group is spearheading the development of orbital and oculoplastic surgeries and related research in Hong Kong. We operate the first and only thyroid eye clinic, which is currently using multimodal imaging to guide combinational immunosuppressive therapies for progressive thyroid eye disease (TED). We have also optimised an individualised, minimally-invasive orbital decompression algorithm for Chinese patients with established TED.

Our multidisciplinary initiatives include Mohs micrographic surgery for eyelid cancers, 3D printing for orbital fracture (trauma) repair, and endoscopic navigation in orbital (tumour) surgeries. Additionally, our group continues to be a regional centre in lacrimal (tearing) disorders and the study of long-term surgical outcomes. We have also led multi-centre clinical trials and introduced next-generation endocanalicular operations. Furthermore, we have conducted translational research in circulating biomarkers and cellular mechanisms in TED and other emerging orbital disorders, including idiopathic orbital inflammation and IgG4 related disease.

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Diagnostic and Treatment Innovations in the Management of Glaucoma and Optic Neuropathies

Glaucoma is a leading cause of irreversible blindness today. Supported by four General Research Funds over the past four years, our group has pioneered a number of imaging and virtual reality technologies for the detection and monitoring of optic nerve degeneration to guide treatment decisions in glaucoma patients.

We have published more than 120 peer-reviewed scientific articles, and some of our findings have been adopted in the formulation of consensus statements by the World Glaucoma Association. To discriminate between disease-related and age-related optic nerve degeneration in glaucoma patients, we developed the Trend-based Progression Analysis (TPA). Recently, we received the Innovation of Virtual Reality in Medical Application award for developing a virtual reality platform to evaluate visual disability, a development made possible with the support of the Innovation and Technology Fund.

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Ophthalmic Genetics

Genetic risk factors are an important component in the mechanism of eye diseases. At CUHK, we are committed to exploring the genetic basis of eye diseases. Our genetics team works closely with ophthalmologists and has adopted multi-dimensional approaches to identify disease-causative and-associated gene variants, population-specific genetic patterns, gene-gene and gene-environmental interactions, and disease gene functions in major eye diseases. These diseases include myopia, glaucoma, age-related macular degeneration, diabetic retinopathy, uveitis, keratoconus, and retinitis pigmentosa, as well as quantitative ocular traits such as corneal thickness, axial length, intraocular pressure, and optic disc parameters. We also collect longitudinal data of diseases, including myopia and glaucoma, with the aim of identifying genetic determinants for disease progression.

We have published more than 200 papers on ophthalmic genetics in indexed international journals, including the leading journals *Science* and *Nature Genetics*. All these achievements have enabled us to provide genetic testing, counselling and education to our patients and the community.

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