



# Helping patients with glaucoma

Glaucoma is the most common cause of irreversible blindness, affecting more than 70 million people globally, of whom 7 million are blind. The number of people with glaucoma is expected to increase by 21 million worldwide by 2020. The condition is fully or partly responsible for 13% of blindness in England and Wales making it one of the leading causes of preventable blindness in the UK.

## What is glaucoma?

In fact, glaucoma isn't just one condition but the name given to a group of different conditions in which the optic nerve (the nerve carrying sight to the brain) at the back of the eye suffers damage, often associated with excess pressure inside the eye.

Damage to the nerve cells in the optic nerve and in the retina causes patchy vision loss which varies in severity and gets progressively worse without treatment. Loss of vision is permanent, but early treatment can minimise damage.

Glaucoma in adults falls into two categories – open angle glaucoma and closed angle glaucoma (which is common in Asia and accounts for half of all glaucoma blindness there).

Moorfields R&D has been instrumental in helping to save the sight of patients with both types of the condition and thanks to recent treatment advances, it is now estimated that more than 95% of those diagnosed early will retain useful sight for life.

## Reducing complications and increasing the success of glaucoma surgery

If diagnosed early, glaucoma can often be treated with eye drops, but around 2% of sufferers are likely to require surgery in their lifetime. The operation is complex and can lead to complications, the most common of which is scarring. Treatment for this scarring has, in the past, involved multiple, painful injections following surgery.

Many years of laboratory research at the UCL Institute of Ophthalmology (IoO), investigating the wound-healing process of cells in the eye after surgery, discovered that the fibroblast cells which caused this damaging scarring responded to very short chemical treatments. Subsequent trials by the same Moorfields glaucoma research team – led by Professor Sir Peng Tee Khaw, professor of glaucoma and ocular healing – identified how a single five minute treatment with anti-cancer drugs 5-FU and mitomycin-c worked and could help to reduce scarring. Further studies in the UK, Africa and Asia have endorsed these findings and show that, when given as a single application, 5-FU is more effective compared to previous treatments.

## The Moorfields' Safer Surgery System

The Moorfields team has also been researching how simple changes to surgical techniques could dramatically reduce the incidence of other potentially blinding complications after the most common type of glaucoma surgery, known as trabeculectomy.

Based on clinical and laboratory research, they have made changes to the techniques and instruments used for making the surgical cuts, applying a larger area of cytotoxic drugs, changing the position of the incision and using special sutures to control the direction and quantity of fluid flow out of the eye.

Professor Khaw has called this the Moorfields Safer Surgery System.

## Better results for patients

The results for patients have been encouraging. Fifteen years ago a UK study showed that early and late complications occurred in more than 40% of patients. Using the Safer Surgery System principles, most of these complications have been markedly reduced, in most cases to less than 5%. Studies around the world have shown similar outcomes, resulting in real practical benefits for hundreds of thousands of patients.

The safer surgery principles are now being used to develop a new generation of anti-scarring and surgical techniques with micro devices to further improve glaucoma surgery around the world.

*"While complications are a risk, modern glaucoma surgery techniques, as developed by Khaw and colleagues, have greatly reduced the risk of both intra- and post-operative complications."*

Review of Clinical Practice (2011) by King, Stead and Rotchford in the British Journal of Ophthalmology

## Understanding, identifying, treating and preventing angle closure glaucoma

Angle closure glaucoma - caused by obstruction to the drainage of fluid from the back of the eye - makes up only about 10% of glaucoma cases in western societies.

Large scale research conducted by Professor Paul Foster and his team at the UCL Institute of Ophthalmology (IoO) and Moorfields has improved the understanding of angle closure glaucoma, leading to faster identification and treatment of the condition. In the UK, this has reduced emergency surgery for the condition by a massive 45%.

The scientists developed a revolutionary classification system for the three key stages of the disease, and determined that a treatment called laser peripheral iridotomy reversed the anatomical abnormality of the eye at an early stage, preventing the development of the condition in around 75% of patients.

This led to a further development, as early laser iridotomy, performed before the condition became acute, allowed researchers to identify a way of using images of the front of the eye to better predict when laser surgery would be successful.

The work has influenced clinical guidelines in Asia Pacific, Europe and the USA and has led to a far better managed identification and treatment of the condition, by spotting and treating risk factors early to correct abnormalities which would have led to blindness.

*"When I was training I looked after patients who had failed many surgeries and eventually lost vision. I have seen the outcomes of many similar patients transformed with better surgical techniques developed through research. Research has changed so many lives for the better and I hope it will continue to do so in the future."*

Professor Sir Peng Tee Khaw – PhD FRCP FRCS FRCOphth FRCPath FCOptom Hon DSc FARVO FSB FMedSci. Professor of glaucoma and ocular healing, and consultant ophthalmic surgeon