Preventing secondary cataract

A new focus for AMD drug target could reduce the need for millions of follow-up eye operations

Scientists may have found a way to prevent complications from surgery to treat cataract, the world’s leading cause of blindness. The study was part-funded by eye research charity Fight for Sight and is published by a research team at the University of East Anglia (UEA) in the open access journal Scientific Reports.

It’s estimated that by the year 2020, 32 million people will need cataract surgery. Cataracts develop as we age, such that the eye’s lens turns from clear to cloudy.

Surgery works well to restore vision. Natural lens cells are removed from the inside of the lens, which leaves an outer casing called the ‘capsular bag’ that can house a clear, artificial lens. The capsular bag effectively ‘shrink-wraps’ the new lens and holds it in place.

However, a few natural lens cells always remain after surgery. In time the eye’s wound-healing response leads the cells to spread across the underside of the artificial lens. This interferes with vision, causing what’s known as ‘posterior capsule opacification’ or secondary cataract.

“Secondary visual loss responds well to treatment with laser surgery,” says Dr Michael Wormstone, from UEA’s School of Biological Sciences, who led the study. “But as life-expectancy increases, the problems of cataract and posterior capsule opacification will become even greater in terms of both patient well-being and economic burden. It’s essential that we find better ways to manage the condition in future.”

Newer artificial lenses are being designed to be placed into a capsular bag that stays open, instead of shrink-wrapping closed. The thinking is that if fluid in the eye (aqueous humour) can flow around the artificial lens, it will dilute and wash away the cell-signalling molecules that encourage re-growth.

In this study, the researchers took a 2-pronged approach, using human cells and tissue. They first tested the idea that diluting growth factor can prevent cells invading the posterior capsule. They also aimed to understand more about which growth factors drive the process with a view to developing a future drug treatment.

“Our results show that reducing the amount of growth factor that’s available around the intraocular lens significantly impedes cell invasion and adds to the evidence in favour of open-bag cataract surgery,” continues Dr Wormstone. “Moreover, we found that vascular endothelial growth factor (VEGF) plays an important role in cell growth and survival. Therefore we believe that anti-VEGF treatment is a logical target for new drug treatments that could help enhance the effect of better lens design and placement, to prevent secondary cataract.”

“These are encouraging results, with research to develop new intraocular lenses that incorporate anti-VEGF treatment into their design as a potential next step,” says Dr Dolores M Conroy, Fight for Sight’s Director of Research. “Whether this will work depends on many factors including the safety of anti-VEGF treatment in this part of the eye. However its current use as a treatment to block new blood vessel growth in the wet form of age-related macular degeneration means there is already a body of research from which we can perhaps draw useful insights.
“Reducing the need for secondary cataract surgery is a highly important goal and indeed, preventing PCO was identified as a high priority by patients in the Sight Loss and Vision Priority Setting Partnership – a consultation to set priorities for eye research.”

Follow-up work from the group will be presented at the Association for Research in Vision and Ophthalmology annual meeting (ARVO 2016) which takes place in Seattle from 1-5 May.

Ends

Notes to editors

Publication


http://www.nature.com/articles/srep24453#additional-information

Fast facts

- Over 300,000 cataract operations take place each year in the UK; it’s the most common surgical procedure
- Cataract is responsible for 51% of all blindness worldwide
- The study also received funding from The Humane Research Trust
- The Sight Loss and Vision Priority Setting Partnership report is online at http://sightlosspsp.org.uk/
- Information about ARVO 2016 can be found on the website http://www.arvo.org/AM/

Fight for Sight is the leading UK charity dedicated to funding pioneering research to prevent sight loss and treat eye disease. Fight for Sight is funding research at leading universities and hospitals throughout the UK.

Major achievements to date include: saving the sight of thousands of premature babies through understanding and controlling levels of oxygen delivery; restoring sight by establishing the UK Corneal Transplant Service enabling over 52,000 corneal transplants to take place; providing the funding for the research leading to the world’s first clinical trial for choroideremia; bringing hope to children with inherited eye disease by co-funding the team responsible for the world’s first gene therapy clinical trial; and identifying new genes responsible for glaucoma, retinitis pigmentosa, keratoconus and other corneal disorders, and Nance-Horan syndrome.

Fight for Sight’s current research programme is focusing on preventing and treating age-related macular degeneration, diabetic retinopathy, glaucoma, cataract and corneal disease. We are also funding research into the causes of childhood blindness and a large number of rare eye disorders.

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The University of East Anglia (UEA) is among the top 1% of universities globally (Times Higher Education World Rankings 2014-15) and placed 10th in the UK for the quality of its research output (Research Excellence Framework 2014). Also known for its outstanding student experience, it has achieved a Top 10 rating in the National Student Survey every year since the survey began. UEA is a leading member of the Norwich Research Park - one of Europe's largest concentrations of researchers in the fields of environment, health and plant science. www.uea.ac.uk.