Janice Krushner Memorial Lecture 2010

Glaucoma Research and the IGA: Addressing the major issues

DF Garway-Heath MD FRCOphth IGA Professor of Opthalmology for Glaucoma And Allied Studies, UCL

Firstly, I would like to take this opportunity to thank the IGA for funding the position of IGA Chair, as you can see the organisation funded £2½ million worth of research over the last ten years and investment in the Chair is another significant contribution to research.

What I thought I would do during the next hour is give you a flavour of what to expect from the new Chair position. I will first talk about what it is, where it is located and how it fits in within research in the UK and Internationally. I will then run you through some of the research that I am undertaking personally, those carried out by other members of my research group and briefly the other research projects funded by the IGA. Finally, I will discuss how we can keep research relevant and involve the members of the IGA in decisions related to funding.

The IGA Chair

What is the IGA Chair?
As Michael Miller, Chairman of the IGA, has said it is the International Glaucoma Association Professor of Ophthalmology for Glaucoma and Allied Studies ('allied studies' was added after a wise person asked what would happen if a cure for glaucoma was discovered while the Chair was still in post). My objective is for the Chair to be relevant to the real world and for members of the IGA to help in achieving this goal.

What does the Professor do?
Obviously research is top of the list and it will be the main topic of this talk. But there is also education and training. For example, I have had over the ten years since I was appointed as a Consultant, four students who have completed their thesis and I currently have another nine either in research or writing-up.

And finally, there is also mentoring: Moorfields is a focus for researchers and trainees and over the last ten years I have had visiting Research Fellows from all over the world, and one of my previous MD students has even now become a Clinical Lecturer on his way to becoming a Clinical Academic within the NHS. In addition, I am also involved in two other education programmes: I am the Co-Chair of Eye Campus, an initiative supported by Pfizer and to which 2000 ophthalmic clinicians (i.e. doctors, nurses, and optometrists) have signed up, and I am the Section Editor for the Glaucoma section of Ophthalmopedia, an initiative set up between the Department of Health and the Royal College of Ophthalmologists, which aims at providing a knowledge base for the training of residents within the UK. Thanks to my involvement in these two programmes, the IGA will be able to get air time in the future.

Where is the IGA Chair held?

The post is located at University College London (UCL) which is a significant player in academia (Fig 1). The University was ranked 4th University in the world by the Times, after Harvard, Cambridge and Yale in 2009 and if we look at medicine and pharmacology only, UCL is 10th in the world and 1st in the UK. UCL is also the most cited institution in the UK and is the 13th in the world.

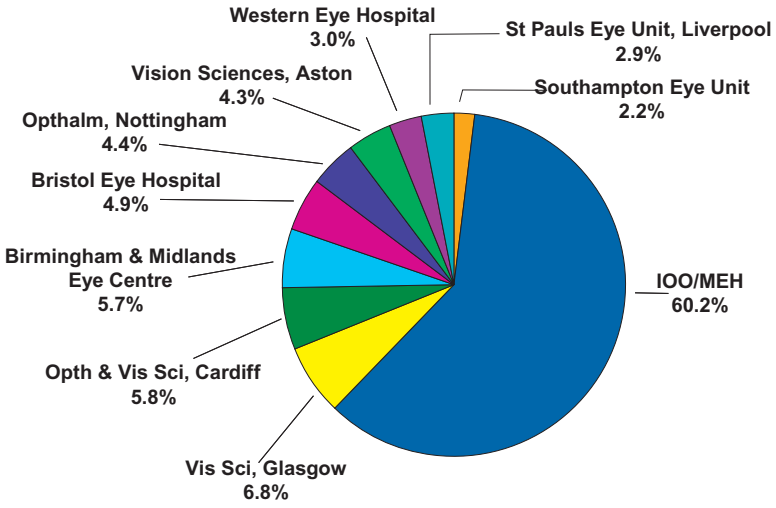
Fig 1. University College London (UCL)

But more specifically, the Chair is held jointly between Moorfields and the Institute of Ophthalmology (IOO). Moorfields is the oldest and largest Eye Hospital in the world and it is internationally renowned for its clinical and academic work (Fig 2). It employs 1,200 people across eleven sites and sees 26,000 patients a year with 24,000 operations. The joint site Institute and Moorfields leads the worldwide eye research centre publications ahead by a significant margin of all of those anywhere else in the world including the US. It has researchers in fifteen disciplines and given that breadth it is the leader in the world. It has access to 100,000 more patients than any other eye institute in the world. Within the UK, it has got more publications than all the other eye research centres and the IOO, amongst all academic institutions, is in the top three in the amount of funds attracted per lead staff member.

Fig 2. Moorfields Eye Hospital NHS Foundation Trust

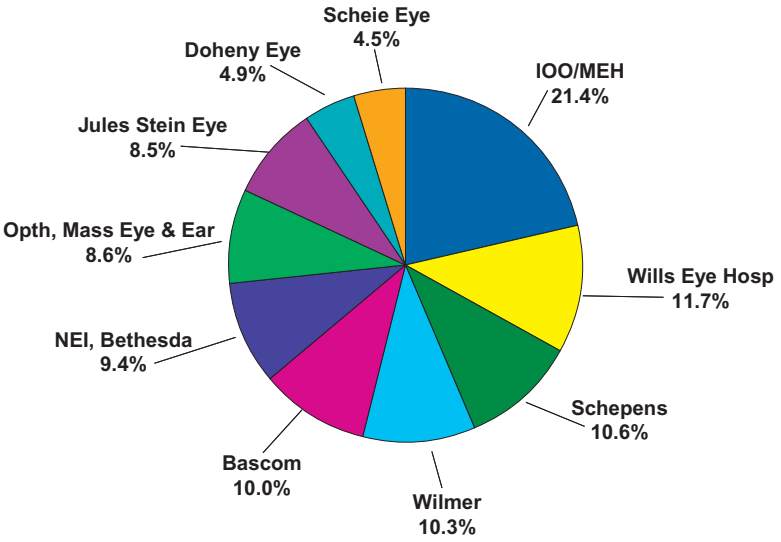
(Fig 3 & 4) Here are a couple of pie charts to show the research output from Moorfields and the IOO between 1998 and 2003, in the UK and worldwide.

Fig 3. National Publications April 1998 to April 2003



As you can see, IOO/Moorfields is the biggest single publisher of materials in ophthalmology in the UK and in the world, ahead of all these institutions in the States. So it provides good infra structural support for a Chair position in ophthalmology.

Fig 4. International Publications April 1998 to April 2003



How does the funding of research in the NHS work?

The National Institute for Health Research (NIHR) created twelve Biomedical Research Centres, each deliberately set up within leading NHS and University partnerships, to drive innovation and translational research in biomedicine. There are five comprehensive ones for general medicine and surgery and seven specialist ones which include Moorfields for ophthalmology. In addition, within Moorfields, the Biomedical Research Centre is divided up into a number of themes that relate to different eye diseases, i.e. age related macular degeneration (ARMD), diabetes, glaucoma, ocular surface disease, paediatric inherited eye disease and wound healing & pharmacology.

While Medical Research Councils (which are government agencies) are responsible for the initial research,

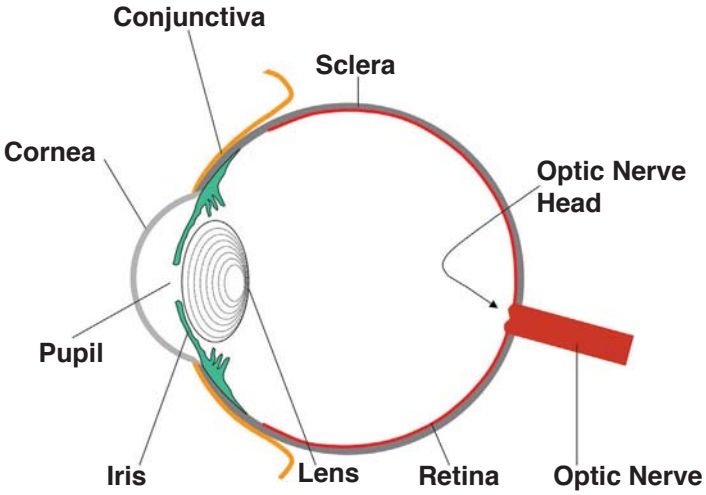
i.e. the basic research and the developmental pathways, the NIHR takes the project from the laboratory and translates it into health care for patients which includes streams such as the innovation for invention and programme grants, all the way through to service delivery. The objective is that each stage of translation of research findings is catered for by different aspects of research funding. Currently, what the IGA needs to do is to decide where its funding should fit within this framework and where the missed opportunities are.

What is glaucoma?

I am now very briefly going to run into a little bit of anatomy for you before I tell you about some of the research that we are doing so that you understand what the research is directed at. Glaucoma, as you know, is a chronic progressive condition of the optic nerve. It affects 2% of those over 50 but 5% of those over 80. So, with the increasingly ageing population glaucoma is becoming much more common as a condition. Recent research is suggesting that the impact of field loss as a result of glaucoma is actually rather earlier in the stage of the disease than we previously thought.

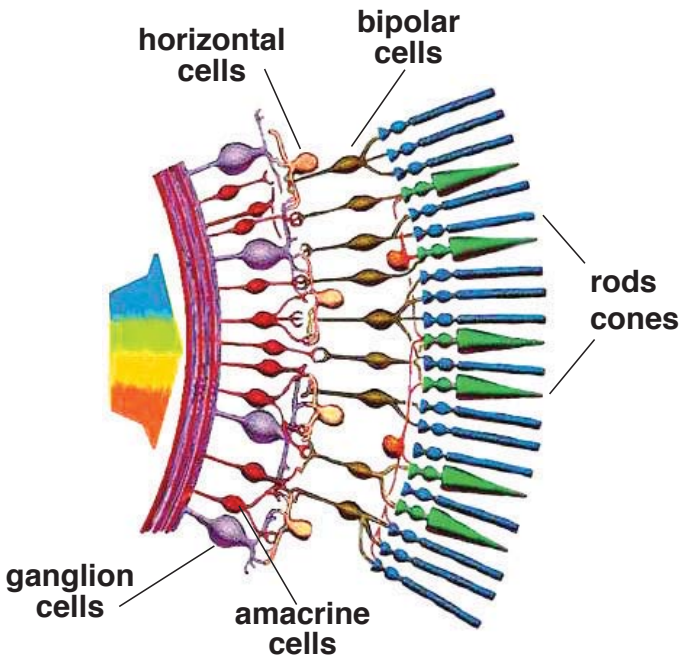
(Fig 5) Looking at the anatomy of the eye, the light enters through the pupil and is focused by the cornea and the lens onto the retina which is the light sensitive part of the eye. The retina is made up of light-sensitive cells which transmit signals to nerve cells on the surface of the retina (Fig 6).

Fig 5. Anatomy of the eye, side view



These nerve cells send out nerve fibres that collect together at the optic nerve head to leave the eye through the optic nerve and go to the brain. It is at the optic nerve head that the damage is caused in glaucoma.

Fig 6. Light-sensitive cells in the retina



Here are schematics of these nerve fibres leaving the eye through this sieve-like structure called the lamina cribrosa (Fig 7). This is the area we are most interested in: the centre of the nerve and these striations of the nerves on the retinal surface (nerve fibre bundles). Looking face on, the nerve fibres make up what we call the neural rim of the optic nerve head (Fig 8).

Fig 7. The optic nerve, side view

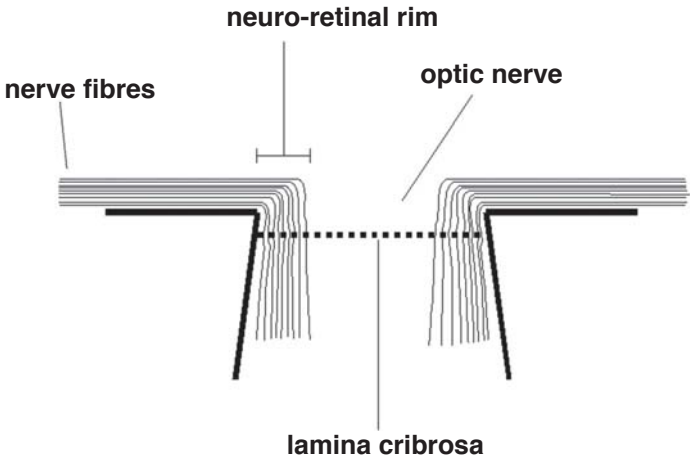
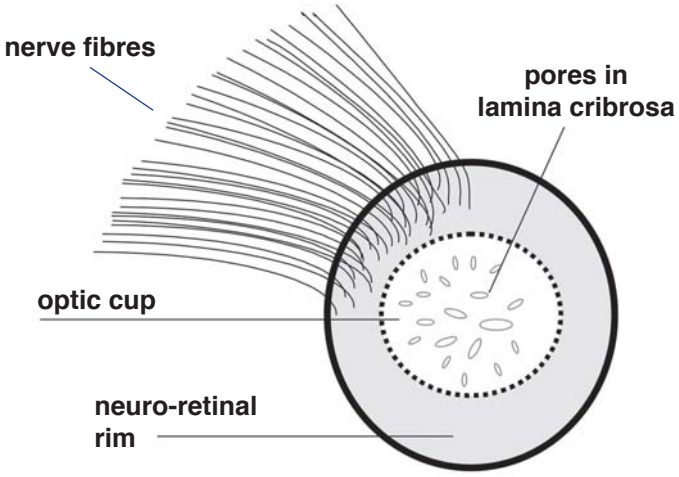
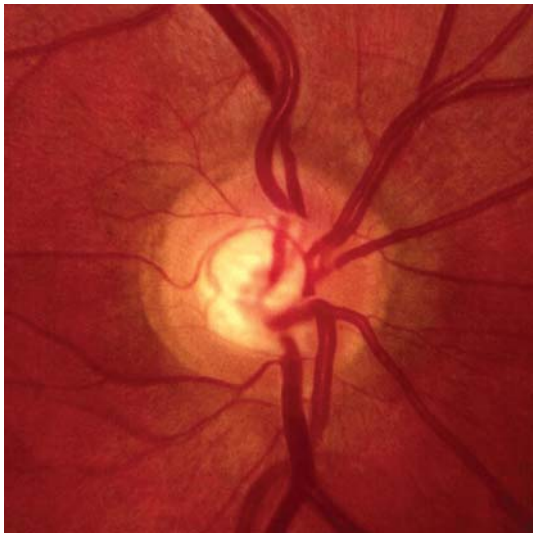


Fig 8. The healthy optic nerve, face on view



We often hear about cupping in glaucoma which is when the cup in the middle expands and this is a photograph of a healthy nerve (Fig 9).

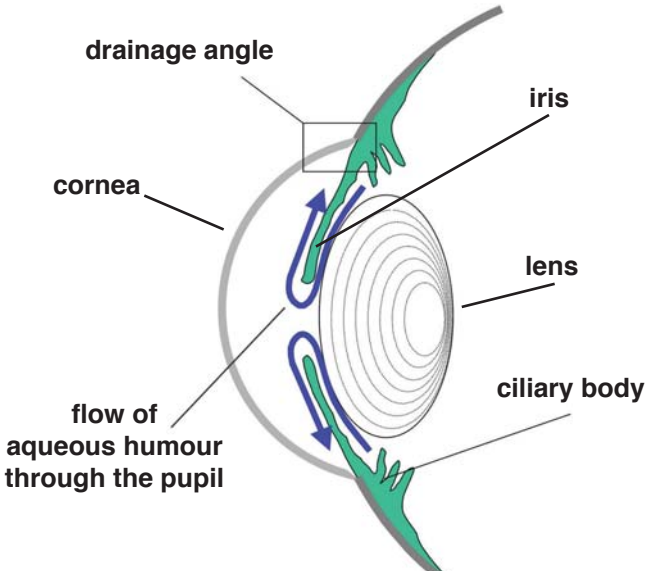
Fig 9. Healthy optic nerve



All eyes have a pressure (intraocular pressure) inside them to keep them inflated and that pressure is maintained by fluid produced by the tissue called the ciliary body (Fig 10). The fluid flows over the surface of the lens through the pupil and then drains away in what we call the drainage angle between the iris and the cornea.

Glaucoma is a relative restriction of the outflow which causes a rise in pressure in the eye. This pressure causes damage to the nerve fibres as they leave the optic nerve head.

Fig 10. Outflow of aqueous humour



That damage manifests as a loss of these nerve fibres so that the neural rim becomes narrowed (Fig 11). The loss of nerve fibres is referred to as nerve fibre defects (Fig 12).

Fig 11. The neural rim becomes narrower

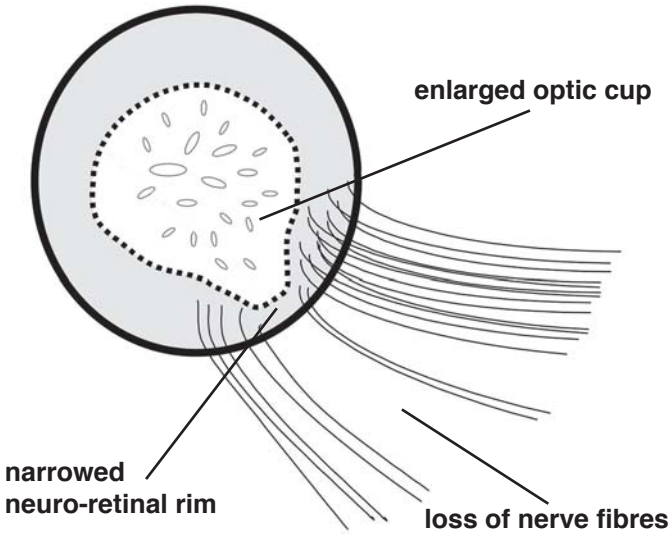
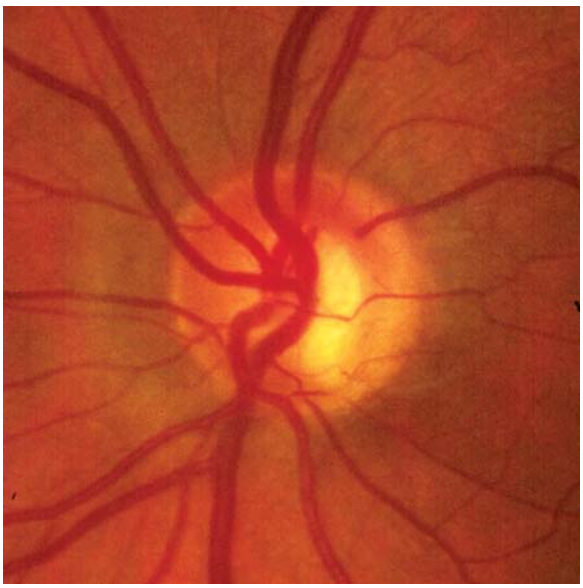


Fig 12. Damaged optic nerve



We know that the main causative factor in glaucoma is raised pressure leading to this characteristic appearance of the nerve but there are other factors as well. For example, there may be factors in the eye, general factors in the body, genetic factors or even environmental factors that increase susceptibility in some people. Either ones can lead to this characteristic neuropathy or we might identify slight differences in the appearance of the nerve with particular types of these susceptibility factors. In addition, other susceptibility factors might be age related changes such as changes in the biomechanics of the tissue in the nerve and also potential changes in blood flow. For example, ageing can lead to changes in blood flow in the vessels in the optic nerve which can in turn lead to changes in the diffusion of nutrients from the blood into these important tissues, or changes in the structural tissue of the nerve or can even make the nerve tissue itself stiffer and less resilient to the effects of pressure.

Who are the team?

First of all, this is my predecessor, Professor Roger Hitchings who retired a couple of years ago (Fig 13). He was a very eminent researcher in glaucoma and not only was he the previous IGA Professor but he was also Research Director at Moorfields, President of the European Glaucoma Society and President of the World Glaucoma Association. He also was my mentor and I should thank him for leading me on the research path to this position today.

Fig 13. Professor Roger Hitchings

This is most of my research team (Fig 14). It is a collaborative team which includes David Crabb, Professor of Statistics at City University, Aachal Kotecha, Senior Lecturer at City University and Senior Research Fellow at the Biomedical Research Centre, Gay Verdon-Roe, Senior Research Fellow and Dr Tuan Ho, Publications Manager who manages to keep us all tight and working together. As I outlined, research is a collaborative effort. I don't do all of the research myself, I couldn't as I don't have the skills in all the sub-specialist fields that are needed in glaucoma research, consequently I collaborate with other people who do have them. I co-direct the laboratory of measurement techniques in vision at City University where the lead researcher is Professor David Crabb. I have also been working with Dr Ahmed Al-Sheikh (Dundee University) to develop new forms of tonometry (i.e. methods for measuring intra ocular pressure) with the intention of finding more accurate and reproducible methods of measuring pressure. We also are co-applicants with Professor Bill Swanson in the States, who recently received a major research grant of £2.35million using his report data collected by us in the UK. Finally, we have close collaborations with Stephen Swift and Alan Tucker (Brunel University) who are data mining and data analysis specialists.

Fig 14. The research team

Current Glaucoma Research at Moorfields

First of all, I would like to explain to you why we are doing what we are currently doing. Fortunately blindness from glaucoma is relatively unusual but it does occur which is why we need to find out why it occurs. Three major reasons for people losing vision from glaucoma have been identified:

1. People have advanced visual field loss at the time of diagnosis,

2. People have differential susceptibilities to pressure and
3. The two together ('1' and '2') because we are uncertain about some of these susceptibilities, we need to continue monitoring patients to actually measure their progress as we look after them.

Consequently, the key areas for research are:

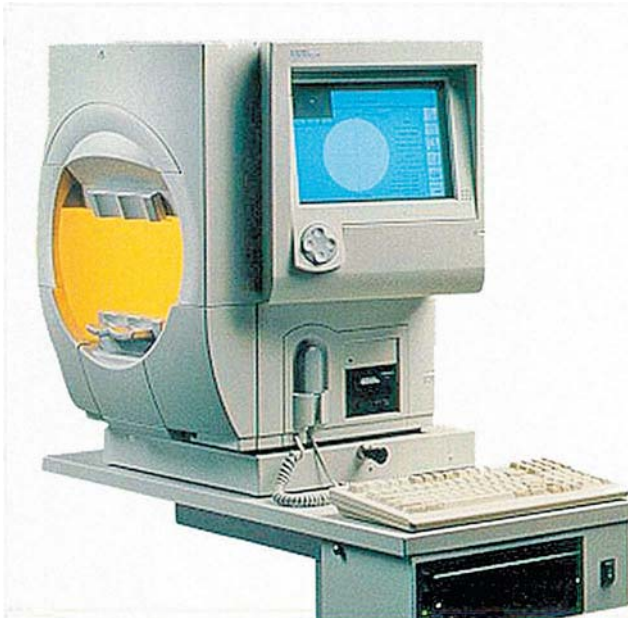
- diagnosis,
- establishing the risk factors and
- monitoring and measuring progression.

Research into diagnosis: The Motion Displacement Test (MDT)

In 2007, a paper published by a group in Aberdeen made the point that two thirds of cases of glaucoma are not currently detected which means that there is a major problem in identifying people who have glaucoma. Glaucoma is currently identified by using a perimeter which is testing the visual field of the patient (Fig 15). It works by testing the sensitivity of the retina to light at a number of different locations. The aim is to identify the patchy loss of vision that occurs in glaucoma.

So why are we still missing so many people? It may be because the visual field testing equipments we have at the moment are bulky, expensive and time consuming, it may be that they don't work very well or it may be that we are doing a test in the wrong locations, so the undiagnosed people are not accessing health care.

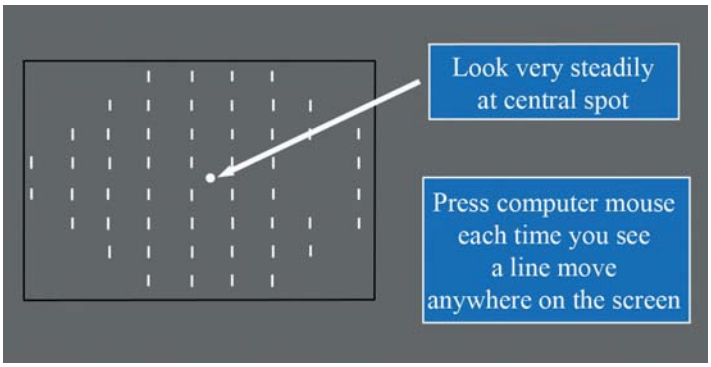
Fig 15. A Perimeter, visual field test



Consequently, we asked the question: can we do better? This is how we came up with the Moorfields Motion Displacement Test or MDT. Originated by Professor Fitzke at the IOO some twenty years ago, and, with my involvement over the past ten years, a laptop based new visual field function test has been developed with the aim that it should be affordable, portable and accessible to everybody. The project has been funded by unrestricted grants from Pfizer, the Friends of Moorfields and the Moorfields Special Trustees, and a website has been set up to enable people to follow our progress (www.moorfieldsmdt.co.uk). The test works by having the subject looking at the point in the middle and then pressing a computer mouse every time they see a line wiggle (Fig 16). Some wiggle a lot, some wiggle less

and you should be able to identify a certain amount of wiggling: if you miss that then we pick up a loss of sensitivity in the retina.

Fig 16. How does the MDT work?



This new test is affordable, portable, low-cost, easy to understand and is robust to the effects of cataracts and refractive error which means that it should be good for case finding. We also hope that all these advantages will enable us to get it to the places where it is needed to identify undiagnosed glaucoma.

In 2008, we won the Medical Research Council Translational Research Innovation Award which was a major achievement because we were pitched against gene therapy for cardiac problems and other research across all of medicine. The project received publicity in magazines such as Optometry Today (publication aimed at optometrists/ opticians) and, for World Glaucoma Day 2008 and 2009, we even took the MDT to the Houses of Parliament and screened a number of MP's.

An independent study was performed to compare the efficiency of the MDT based on a comparison of the number of true glaucoma's picked up by three other different visual field tests. Basically, what we want is for a test to pick up lots of true glaucoma patients and to not pick up too many non-glaucoma patients (false positives). The study showed that the MDT, at a 10% false positive rate, was able to pick up 80% of the glaucomas, while other tests were only able to pick up 50% glaucoma or less.

At the moment, the MDT is still undergoing trials across the world and the next steps with this project are to find further funding (we are looking for a commercial partner) and to develop it as a monitoring test as well.

Research into monitoring: the frequency of visual field testing

It is important to know whether or not treatments are working in glaucoma. Currently, we monitor glaucoma by doing principally visual field tests and imaging, which we score (in terms of disease severity) each time they are done. We have done some research to look at how often we need to do visual field tests because, believe it or not, we actually don't know how often we should test. Here is our reasoning: consider the visual field of a patient with a full visual field is scaled at 0 and a field that has lost all vision is scaled at -30. If this patient loses all

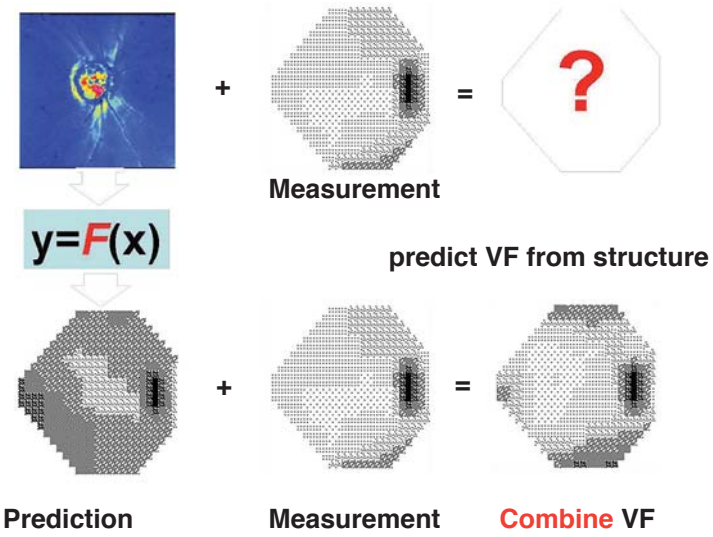
their vision over a 15-year interval, the average rate of visual field loss is 2 per year (=30/15). Consequently, for such a patient, we need to detect the rate of change of two per year. We reckon we ought to be able to pick up this value of two a year.

So we asked the question of how many field tests do we need to achieve this rate of change? We published a paper a couple of years ago looking at this question. The answer was a little disturbing: for new patients, we need to do three visual fields a year to pick up this rate of 2 a year which is a lot more visual fields than we are currently doing in initial glaucoma. This has provided an evidence base for clinical practice and David Crabb has taken this work a little bit further by asking if the way we monitor newly diagnosed patients is efficient if we want to pick up change. It turns out that the answer is no, it is not at all efficient. Currently, newly diagnosed are seen twice a year maximum. What we should do is cluster our tests, i.e. do several ones close together, right at the beginning and then maybe wait a couple of years and then cluster some tests again. This appears to be a much more efficient way of tracking change over time rather than doing tests at fixed intervals.

Research into monitoring: combining visual fields & imaging

We use a lot of imaging devices in glaucoma and one of the questions we asked was: can we use this imaging information to measure rates of change? This is some work that one of our rather clever PhD student's has done. Imaging devices show a 3D image of the optic nerve and nerve fibres are colour coded according to their thickness. Therefore Imaging measures the structure of the optic nerve while the visual field test measures its function and somehow we want to be able to put these together (Fig 17). What we would like to do is to translate this new image into a visual field in order to add it in some way to the real measured visual field. Our student came up with an algorithm, or function, to do it which is called a Bayesian Radial Basis Function.

Fig 17. Imaging and visual field tests



In addition, currently, there is a huge variability in the measurements we make when using visual field tests which makes monitoring glaucoma difficult, so we asked the question: if

we combine our image and our visual field can we reduce that variability? The results showed that by adding the images we have reduced the variability and we will be able to track the cause of glaucoma much better in the future. We are in the process of negotiating with one of the imaging device companies to put this into their software.

Research into monitoring: Tonometry

Some people are more susceptible to pressure than others. Pressure though is the major risk factor for developing glaucoma. We are currently evaluating new devices on the market, developing new devices and performing clinical trials with my collaborator Ahmed Al-Sheikh, in Dundee, in order to improve the accuracy and precision of measurement when using tonometry.

Clinical trials: The UK Glaucoma Treatment Study and the UK Glaucoma Risk Factor Study

Our main clinical trial is the UK Glaucoma Treatment Study (UKGTS) which is the first and only randomised placebo controlled trial in medical treatment of glaucoma. In other words, this is the highest evidence, the best quality research that can be done to establish the efficacy of treatment and it is extraordinary that in glaucoma this hasn't been done before. This is the first time this has been carried out at Moorfields and I lead this project. Involving multiple centres in the UK, 516 patients are taking part (515 have been recruited so far) and the importance of this study lays in the fact that it uses a novel design for follow-ups which is along the lines of the one described by David Crabb's modelling (i.e. clustering of field tests). It is also the first study to use quantitative imaging devices and to include the new pressure measuring devices so we should get a lot of very high quality data from this trial.

We are expecting this landmark study to be a top level of primary evidence for treatment efficacy and to gives us a lot of information about risk factors such as which patients are at greatest risk of losing vision. The trial design will be important as well for future drug trials in industry because we are shortening the period it takes to evaluate drugs in the future. We are now extending the trial to what we call the UK Glaucoma Risk Factor Study (UKGRIFS) which is an extension of the UK GTS following the same patients for two years longer so that we can better identify the risk factors for the progression of glaucoma. We also propose to make more grant applications to look at other potential risk factors for glaucoma that are related to ageing.

Other Clinical trials

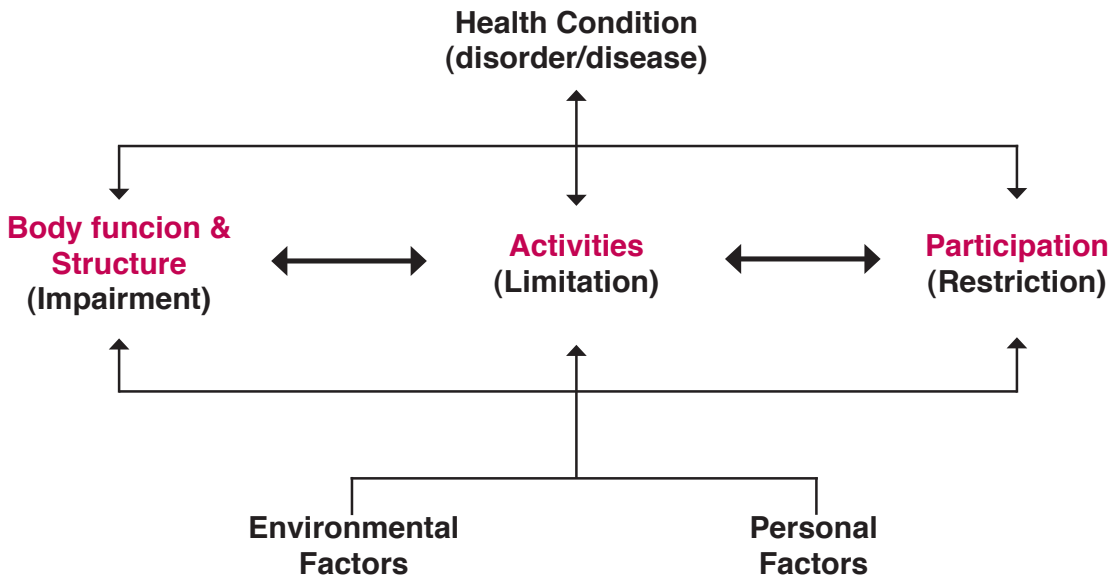
In addition, we are planning clinical trials of laser therapy versus

conventional medical therapy for the treatment of glaucoma and we also would like to perform, if we get funding, a trial of ocular hypertension (i.e. high pressure in the eye without any signs of glaucoma) because we would like to establish exactly which patients who have high pressures are at risk of going on to developing damage of the nerve (i.e. glaucoma). We are also planning on doing a clinical study on a particular sub type of glaucoma called pigment dispersion syndrome. It is thought that making a small hole in the iris is beneficial in this condition but there is no evidence available at the moment to support it, therefore we would like to perform a clinical trial to establish this evidence.

Research into the impact of glaucoma on the individual

This is something that is rarely researched but I think is of major importance. We, as doctors, need to know how glaucoma affects patients. Here is a classification of disease that is made by the World Health Organisation, WHO (Fig 18). It categorises conditions based on the level of disability they lead to (impairment, limitation of activities and restriction into the participation in everyday activities). At the moment we are good at measuring the impairment of vision in the eye but we are very poor at establishing how this limits activities of patients and restricts their participation in everyday activities.

Fig 18. Classification of health conditions

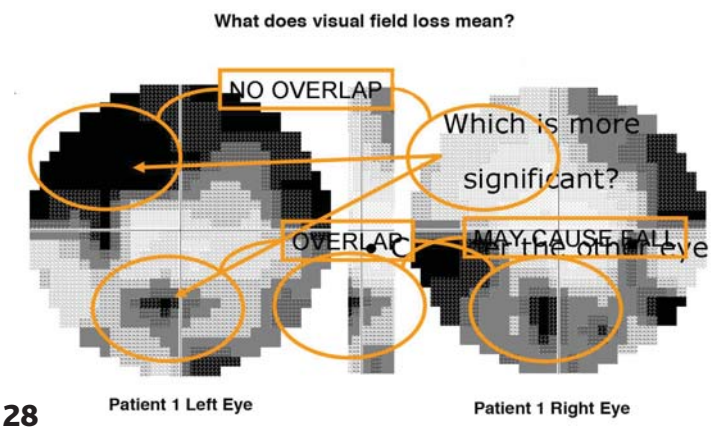


There are also other factors that inter play such as environmental factors and personal factors which need to be looked at as well. This is a major research focus for the Measurement Techniques in Vision Laboratory at

City which is co-led by David Crabb, Aachal Kotecha and myself. Some of the data we will be looking at are questionnaire data from the UKGTS which is self-reported disability from glaucoma patients. Our objective is to relate the patients' responses to the level of damage in the visual field but because this is self-reported data, we would like to go one step further and actually directly measure how patients perform in certain tasks.

At the moment, we use the results of visual field tests to evaluate vision loss for glaucoma patients. The key is that field tests show field loss for each eye separately, but most people have vision in both eyes so we need to look at both eyes together. If you look at both eyes together (Fig 19), we can see that there are overlaps in a couple of areas which means that the loss is actually more important than expected. If we bring the two visual fields together and merge them we can see that there is a defect in what we call the binocular visual field and that's in the position of the field of vision that could cause a fall by missing an obstacle for example.

Fig 19. Two visual field tests (right and left eye) analysed together



When measuring visual field loss, there are various functions that we can look at: we can look at reading, everyday tasks, mobility and driving driving (Fig 20a & 20b).

Fig 20a. Impact of visual field loss on everyday activities

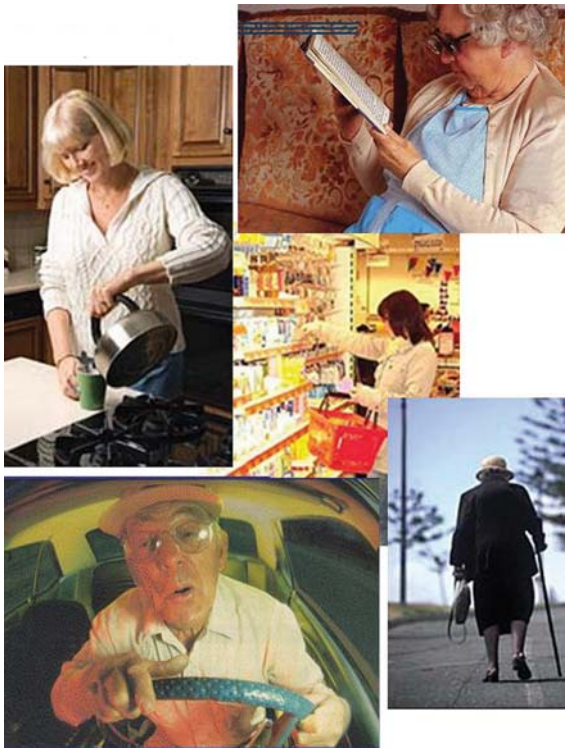
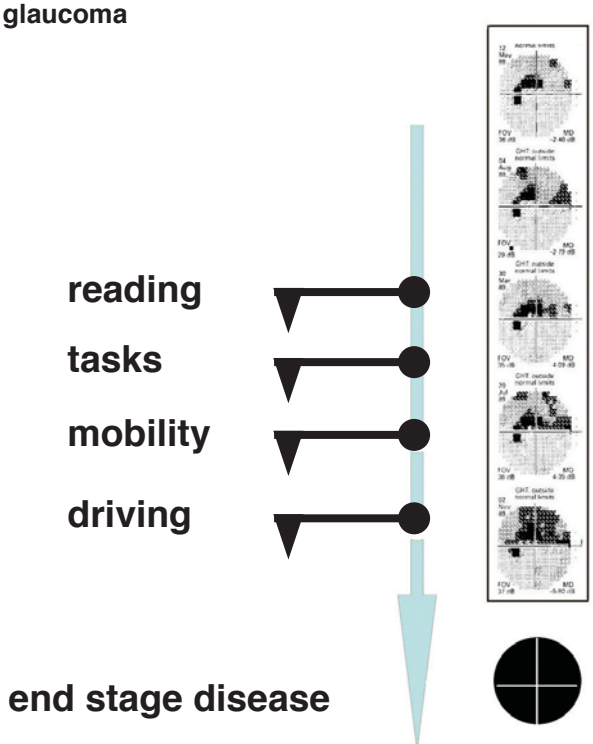


Fig 20b. Performance-based measures in glaucoma



One area we focused on is driving. Using the hazard perception test which is part of the UK driving test and an eye tracker, we got a number of people who didn't have glaucoma and just monitored their eye movements watching the videos.

Then we compared them to a number of patients with glaucoma. The red dots are where the healthy (normal) subject is looking while the blue dot is where the glaucoma patient is looking (Fig 21). So I will run the video and you can see that this particular patient is following the car in front very nicely but perhaps is missing a pedestrian with a pram: the blue dot doesn't look at the pram whereas most of the healthy subjects do.

Why does this particular patient keep missing details? If we look at their binocular visual field and the field defect with both eyes open (Fig 22), we can then superimpose that field defect onto the driving scene to see how it might effect what the patient is seeing as they drive (Fig 23). You can see how the field defect might actually block out the pedestrian with the pram located on the top left corner of the image.

Fig 22. Visual fields of the tested glaucoma patient

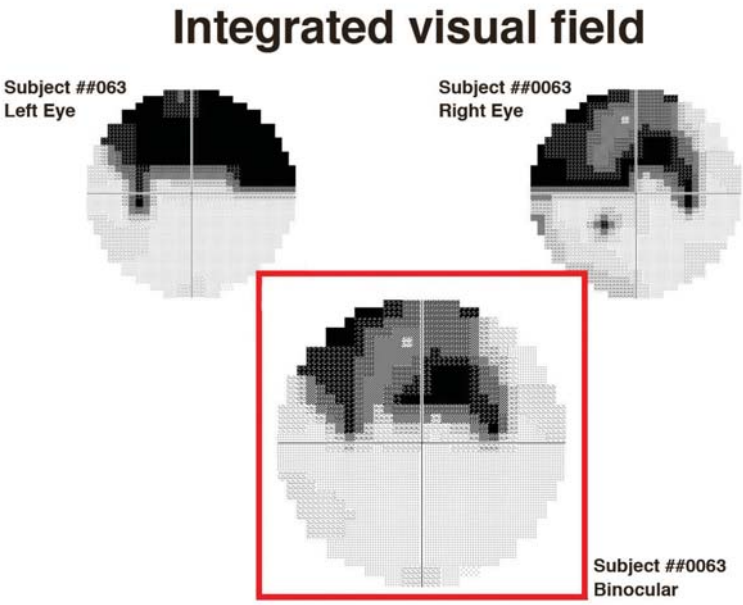


Fig 21. Comparison of the eye movements of a glaucoma patient and a healthy subject

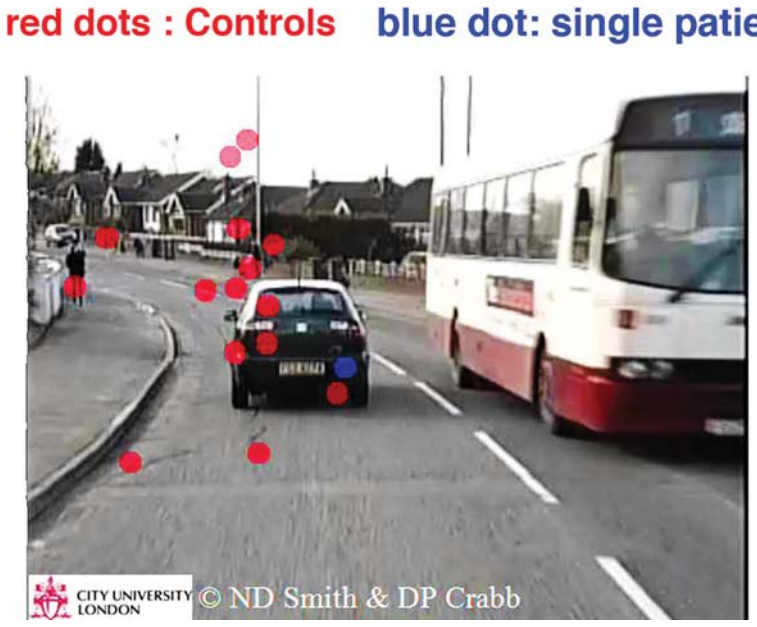


Fig 23. Visual field superimposed onto the driving scene

In another video, a car is coming out of a turning: the red dots show that most of the healthy subjects see the car but the blue dot shows that the glaucoma patient is still looking at the car in front and doesn't look in the direction of the turning car.

Aachal Kotecha has also been studying how everyday tasks like reaching and grasping are affected by glaucoma. In order to do so, little fluorescent markers were placed on the patient's forefinger and thumb in order to track the movements when asked to reach out and grasp something on the table. The markers were then computerised.

This enabled Aachal to find out that patients with glaucoma had a slower onset of movements and variable reach dynamics, which are probably related to a difficulty in localising the object, but there was no difference in grasp once the object had been located. Future work is going to look at balance: we know that glaucoma is related to an increased risk of falling over which can lead to fractures, a major health problem. Therefore, Aachal is going to undertake some work looking at posture and the effects of vision loss on posture and balance in a laboratory.

Current glaucoma research funded by the IGA

The IGA supports research projects carried out all over the the country on: genetics, risk factors, therapy, service delivery and diagnostic imaging.

Firstly, the IGA has supported genetics research consistently over the years. Ann Child, St George's Hospital, has been very successful in identifying genes for glaucoma and has often given talks at the IGA Annual General Meeting to report on the progress of her work. The adult-onset primary open angle glaucoma caused by mutation in the Optineurin study was a significant breakthrough for her team which was published a few years back in the Journal of Science because it discovered a new gene for glaucoma. The genes identified so far only account for about 5-10% of cases of glaucoma, but since her work started in 1993, she has been able to identify 2 or 3 of the genes linked to glaucoma out of the 5-10 genes locations that have been identified so far.

Andrew Lotery, Southampton University, has taken a slightly different approach to identifying genes which is called a Gene Association Study for which you need a very large number of patients with glaucoma. Blood tests are done on each patient and the genome (DNA) is analysed. Over a large number of cases, defects in the genes can be related to the glaucoma features to identify which genes are responsible for it. The reason for doing it this

way is that there probably isn't just one gene, but probably a lot of genes working together to make someone susceptible to glaucoma.

Sancy Low, a PhD student at Moorfields and led by Paul Foster, is currently working on research into the genetics of angle-closure glaucoma. So far around 300 cases have been recruited with the aim to get between 2000 and 3000 cases across the country and they have had some success in identifying regions of DNA where there are likely to be genes associated with angle closure glaucoma (See article published in the winter 2009 edition of the IGA News).

Then the IGA also supports research into other potential risk factors. The University of Liverpool is currently carrying out work on the tissue molecule called thrombospondin which is thought to possibly be implicated in susceptibility to glaucoma. In addition, a grant has recently been awarded to Colm O'Bryan in Dublin to look at the role of connective tissue growth which may also affect susceptibility to pressure in the eye.

Thirdly, the Association has also recently supported research into therapy. Ian Murdoch, Moorfields Eye Hospital, has been working on a really important study looking at ways of preventing excessive healing after glaucoma surgery. This research project was performed in Africa and was partly funded by the IGA (support of the data analysis).

Tony King in Nottingham would like to perform a study looking at early surgery for glaucoma as opposed to medical treatment. In order to do so, Tony needs to identify patients' perception of this sort of research. The IGA is currently funding a study that will allow him to approach a number of patients to find out what they think of that sort of research. Research into service delivery issues is also funded by the organisation. A study on looking at the frequency of visual field testing and the costs associated with the test is being performed by Ananth Viswanathan at Moorfields.

Another project is looking at improving the performance of optometrists in identifying glaucoma in the community. The work is being carried out at Ealing Hospital where various training courses and validation courses are presented to interested optometrists who wish to increase their performance in case finding. The project has shown that additional training does make a difference.

Finally, Rachel North, Cardiff University, is doing some research into diagnostics imaging which is using some of the very new imaging technology to look at the effects of ageing in the eye and trying to identify the reasons why ageing makes some people more susceptible to glaucoma.

Keeping research relevant

What about going forward? There is a huge number of potential research areas that could be funded: for example epidemiology looking at the distribution of glaucoma in the population and environmental factors that might result in a greater prevalence of glaucoma, research into risk factors, research into mechanisms to see whether or not there are defects in certain biochemical pathways that make some people more susceptible.

There is a long way to go still with genetics as well. We need to improve our diagnostic technology as I have outlined earlier and also monitoring technology. Within therapeutics, we need to identify better medicines for glaucoma, improve the results of surgery and there is exciting new research potential into stem cell therapy (therapy using cells which can divide to give more specialised cells). For instance, research is carried out at the IOO looking at replacing damaged nerve cells with stem cells. It is a long way off from coming to patients in the clinic but that research nevertheless has started. Gene therapy (treatment of disease by introducing a new gene into a cell) to repair or replace damaged genes is another potential avenue and there is already research done on this matter by people in Cambridge. In addition, we also need to really look at how we can best deliver services for glaucoma care because I think in many cases the service that we deliver is sub-optimal and there are many ways that we can potentially improve that. We need to look more into the effects of glaucoma on quality of life and disability.

These are all areas in which the IGA may want to get involved in the future, but how do we identify the important questions in research? Who is responsible for these research priorities? Well, obviously the researcher is one of the main players because he/she knows the literature, what has been done in the past, where the gaps in the evidence are, and consequently can identify the knowledge gaps and prioritise the most important ones. We also need to look at the public to find out what people's perceptions are and what their priorities for research are. Not the least, we need to know what the priorities are for people with glaucoma themselves. Do you want more research into quality of life? Do you want more research into developing medicines? Do you want more research into identifying the causes of glaucoma?

Ultimately, the Government makes the final decisions with their social and economic policy, but public researchers and patients can lobby Government to say what we think is important and where we want more

resources to be put into research. This is something we should all do which is why we went to the House of Commons last year for World Glaucoma Day. Our objective was to highlight to the Government how important glaucoma is.

At the IGA, the research strategies are ultimately set by the Council of Trustees with input from medical Trustees, lay Trustees, some of whom have glaucoma, and the Medical and Scientific Advisory Committee which is made of glaucoma researchers across the UK. Unfortunately, we have got a sort of missing link at the moment which is the input from the membership which is why I am going to finish my talk with this message: "please get involved". It is a two way process, the research community needs to communicate with members on various research areas where there is potential and we need you to respond by identifying your priorities and your needs which may have been missed. So please get involved.

Thank you for your attention.

Janice Krushner Memorial Lecture 2010
Questions & Answers

Q1. **I think what would be helpful if you could try and pin point what will be different as a result of the IGA funding this Chair?**

A1 The first thing is that getting research funding isn't easy and a lot of research funding is given on the basis of reputation and status so the very fact of having a position of IGA Professor hopefully will make getting research funding from other organisations such as the NHS, or the Medical Research Council a little bit easier. It also raises the profile of the research that is done across the world and should also make collaborations easier. Already there is a fair collaborative network across the world and we are always looking for opportunities to strengthen that network. The UK itself has an immensely strong foundation in research in glaucoma. We are very lucky and one of the things I intend to do is draw people together and work together a great deal more. This year I am Chairman of the UK and Eire Glaucoma Society (UKEGS) and I will be holding meetings to set up mechanisms to improve collaborations between sites. This should improve both the quantity and the quality of output from the UKEGS.

Q2 Does the fact that the IGA is funding the Chair mean that Moorfields has more money for research?

A2 Effectively yes, it does, because my salary is now being paid by the IGA and the NIHR, the funding can be made available for other research projects. I was also just made a Senior Investigator in the NIHR involving the IGA's help which brings in another £75,000.00 a year to Moorfields and another £15,000.00 as a research fund for me so these things all contribute together to increase the resource for research.

Q3. You mentioned environmental factors and risk factors, can you elaborate on some of those and in particular on the impact of smoking and drinking alcohol?

A3 In all the studies performed no link has ever been found between smoking and glaucoma but we know smoking is bad for other reasons as it causes cardiovascular disease. One of the major additional risk factors for glaucoma, or progression of glaucoma, is blood pressure and having low blood pressure is a bad thing. Imagine if the blood pressure is too low, the blood supply to the nerve head is compromised and it makes the optic nerve head a little bit more vulnerable to the effects of pressure. Now excessive alcohol drinking can lead to high blood pressure and a common cause of low blood pressure is overtreated high blood pressure. So indirectly yes, alcohol could cause problems. Having said that everything in moderation is probably good and we know that red wine has compounds in it which are probably good for the body in general, good for nerves in particular and because glaucoma is a condition of the optic nerve, a moderate amount of red wine is probably a good thing.

The summer edition of the IGA News will include the report of the second presentation given at the Janice Krushner Lecture: 'NICE, glaucoma and the optometrist' by Goeff Roberson and the second part of the Q&A.

IGA is on Facebook

The IGA now has its own page on the social website Facebook.

Follow our work and raise awareness of glaucoma and the IGA by becoming a fan of our page:

http://www.facebook.com/#!/pages/International-Glaucoma-Association/301238320762?ref=ts

Please re-type the above blue text into your web browser if you are a Facebook member and invite all your friends to become a fan!