Studying **RE**tinal structure with a**D**aptiv**E** optics and **F**unct**I**o**N** with multifocal **E**lectroretinogram (REDEFINE)

Introduction

We would like to invite you to take part in a study of a new kind of photo of the retina at the back of the eye, with a new camera called an adaptive optics scanning laser ophthalmoscope. With this camera we can see how the individual cells that allow you to see appear at the back of the eye. We are trying to learn if how these cells look at the back of the eye is related to how they respond to light, and how this effects how well you can see. To measure how these cells respond a clinical test called a multifocal electroretinogram is used, which tells us how the light responsive cells respond in specific areas at the back of the eye. We wish to look at this in people with healthy retinas so that we can make a meaningful comparison with individuals with diseases of the retina in the future.

Purpose of the study

Disease that affect the retina account for 3 out of 7 leading causes of visual loss in the UK. Most of these disease have very few, if any treatment options. An example of one of these diseases is late-onset retinal degeneration (L-ORD), which is an irreversible, blinding condition with currently no treatment options. To diagnose, monitor and give patients with these conditions information of what to expect with these diseases tests that can sensitively monitor the retina at the back of the eye are very important. In clinical practice, this is often done

with imaging the back of the eye, measuring the how well the eye responds and by the patient reporting how well they can see. The more detailed and sensitive these measures are, the higher the quality of information Doctors can provide to patients. Detailed tests of the back of the eye are also very important for determining how well future treatments are working.

In this study, we will use a new type of test that can allow us to see individual cells at the back of the eye called adaptive optics scanning laser ophthalmoscope. The cameras already used are not able to see this kind of detail. We will be comparing the number of cells at the back of the eye with how well they respond to light with a specialist test called the multifocal electroretinogram. We will use this information to figure out if this has an impact on how well individuals can see. We want to do this first in those who have healthy retinas so that we can understand how this is affected by disease.

We hope this will help us learn firstly, how the retina is affected by disease and secondly how the new measurements that are possible with adaptive optics technology are related to how the retina works and how people can see. We will be able to use this information to better monitor patients with disease and provide them with high quality information about their disease.

Why have I been invited?

You have been invited because we need to have images from people who do not have problems with their retina. The images and tests you let us do will help us to understand the normal structure and function of the back of the eye. This will

be important when we are looking to spot changes at the back of the eye in disease.

Do I have to take part?

No, we understand that the time required to participate may be too much.

What do I have to do?

If you were to take part we would ask that we could spend about 4 hours doing some tests and getting some pictures taken of the back of the eye. If you prefer we can organise this as two separate 2 hour sessions or as one session. You will be unable to drive after both sessions. We will first ask you some quick questions about your eyes and past medical history to make sure you are suitable to take part in this study.

The first tests will involve looking at a letter chart and telling a member of the study team how many letters you can read, this gives us a measure of how well you see. The next tests will all involve having eye drops in your eyes that make your pupil large and stops it shrinking to light. This lasts approximately 4 hours and means you **cannot drive** after having them as it can blur you vision slightly. We can provide some reimbursement for travel costs due to this. Once the dilating drops have worn off (usually 4 hours) you can drive again. After your pupils are dilated we will use a camera called an optical coherence tomography (OCT) to image the back of the eye, OCTs are used in normal eye clinics.

We will then perform a multifocal electroretinogram (mfERG). This will involve looking at a screen with black and white hexagons flashing on and off while we record the activity from your eye. To do this we will use sticky-pad electrodes around the eye, on your forehead and small corneal electrodes will contact the front of your eye, the cornea, this is shown in the blow figure (Figure 1). This test takes between 5 and 10 minutes once you are set-up. We will also perform a full-field electroretinogram (ffERG), which uses the same electrodes as the mfERG but we will use flashing lights to record how the eye responds. We will do this test in the light and after you have sat in the dark for 20 minutes. This test will take 30 minutes once you are set up. After these tests we will either finish your visit and ask you to come back to Newcastle University on a different day for some more tests or after a short break do the rest of the tests on the same day.

For the second set of tests we will take pictures of the back of your eye with the adaptive optics camera. This will involve looking at targets in the distance while a light is shone into the back of your eye. To keep your head and eyes as still as possible during the imaging we will make a dental impression of your mouth and you will be required to bite onto this impression on a bite bar during the imaging. This can take quite some time, we usually allocate 2 hours to this session so we can give you plenty of breaks.

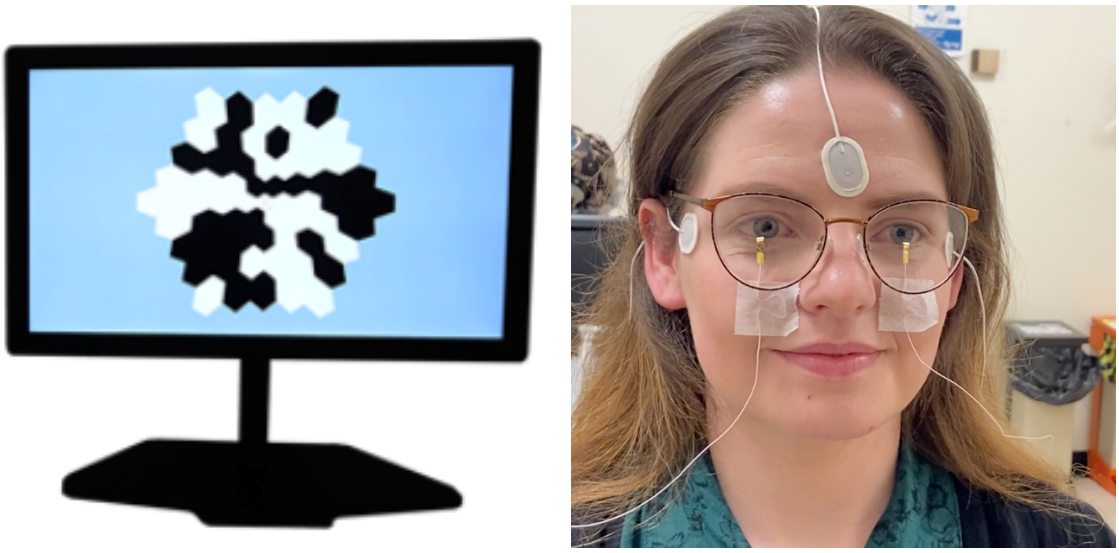

Figure 1: An example of the screen that you will have to look at for the test (left) and the wires we will use to record the activity (right).

What are the risks and how are they minimised?

As with all medical procedures, there are some small risks. There is a small risk that the pattern on the screen can make some feel slightly sick; this is extremely rare. There is also a small risk that the electrodes that sit under the lower lid could cause a corneal abrasion; however, this can be avoided by avoiding scrunching or rubbing the eyes while these are in place. Any irritation felt from the corneal electrodes will typically wear off minutes after they have been removed after testing. The eye-drops we use may cause slight discomfort, such as stinging, when they are first administered but this should last only a few seconds.

We will minimise all of these risks by talking you through every procedure and the study team have multiple years of experience in performing the study procedures.

What will happen to the results?

We will look at the pictures from the adaptive optics camera and analyse them to see how many cells are in each area and how they are arranged. We will compare this to how the cells are responding in the corresponding area of the mfERG. All of the results will be compared to how you can see. The information we are given will not be shown to anyone outside of our research team but with your permission we would like to use anonymous data in future research. The results of the study will be shared with other doctors and scientists but it will not be possible to identify your information.

Will my taking part be kept confidential?

Yes, it will only be possible for members of the research team working in the hospital to identify who gave images and data. You are free to tell who you like about your participation. With your permission, we will record your participation in our study records and inform your GP. If we find any incidental findings from our clinical tests an ophthalmologist will review the results to determine significance, we will inform your GP and appropriate action will be taken.

What happens if I lose my capacity to give consent during the study?

In the highly unlikely event that you are unable to confirm your consent to participate during the study you would be removed from the study. Identifiable data already collected about you with your consent would be kept and used in the study. No further data about you would be collected or any other research procedures carried out. You can leave the study at any point for any other reason.

How will we use information about you?

We will need to use information from you for this research project.

This information will include your:

- Name
- Contact details
- NHS number
- Date of birth.

People will use this information to do the research or to check your records to make sure that the research is being done properly.

People who do not need to know who you are will not be able to see your name or contact details. Your data will have a code number instead.

We will keep all information about you safe and secure.

Once we have finished the study, we will keep some of the data so we can check the results. We will write our reports in a way that no-one can work out that you took part in the study.

What are your choices about how your information is used?

You can stop being part of the study at any time, without giving a reason, but we will keep information about you that we already have.

We need to manage your records in specific ways for the research to be reliable. This means that we won't be able to let you see or change the data we hold about you.

If you agree to take part in this study, you will have the option to take part in future research using your data saved from this study.

Where can you find out more about how your information is used?

You can find out more about how we use your information:

- at www.hra.nhs.uk/information-about-patients/
- by asking one of the research team
- by sending an email to stephanie.quinn2@nhs.net
- by ringing us on 0191 2825174.

Who is organising and funding the research?

The study team includes Stephanie Quinn, a Clinical Scientist in Ophthalmic and Vision Science at Newcastle upon Tyne Hospitals NHS Foundation Trust; Dr Laura Young, a UKRI Future Leaders Research Fellow at Newcastle University; and Dr Andrew Browning a Consultant Ophthalmologist at the Newcastle upon Tyne Hospitals NHS Foundation Trust and Associate of Newcastle University. The research has been funded by a local Research Capability Fund.

Who has approved this project?

This project has been reviewed by clinicians and academics at Newcastle upon Tyne Hospitals NHS Foundation Trust and Newcastle University. The project has also been reviewed and approved by the North of Scotland Research Ethics Committee (1).

Contact details

We would be happy to answer any questions you have about the study. If you prefer to use email you can contact the principal investigator at stephanie.quinn2@nhs.net or you can speak to the principal investigator during the study period Monday-Friday 9am-5pm on 0191 2825174.

Availability of study results

If you would like to find out about the results of the study then please let us know and we will make a note when we take your photos. If you are happy to

provide an email or postal address, which will be used for no other purpose, then we will send you a summary of the study once it is finished.

Other points of contact

If you would like any information about the study or have any concerns about the way it is being done we would like to hear from you. Please feel free to speak with one of our researchers. If you prefer to raise your concerns with someone not involved in your care, you can contact the Patient Advice and Liaison Service (PALS). This service is confidential and can be contacted free on 0800 032 0202.