‘Electrical tests’ of vision

‘VISUAL ELECTROPHYSIOLOGY’

Magella Neveu, Chris Hogg, Graham Holder

Electrophysiology Department, Moorfields Eye Hospital

National Institute for Health Research

What is ‘electrical testing’ so called ‘visual electrophysiology’?

Visual electrophysiology measures the very small signals generated by the eye and the brain in response to what we see or look at. They give information regarding eye, nerve and brain function that helps the doctor make decisions on diagnosis and treatment.

Why would I be referred for electrophysiology testing?

The main reasons for referral are?:

- To confirm or exclude a suspected diagnosis
- Unknown diagnosis
- To determine the characteristics and severity of disease
- To monitor the disease before and after treatment

What tests can I expect?

TEST 1: The Electroretinogram (ERG)

The ERG examines the electrical responses of the whole retina to precise flashes of light. These responses have an expected pattern (timing, shape, size) in individuals with normal vision, and are altered in a predictable manner in disease. We can assess cells in retina which serve day vision (cones) as well as night vision (rods)

Small disc electrodes are placed on the skin at the side of the patient’s eye. The pupils are dilated using drops and following a period of twenty five minutes in the dark, soft gold foil recording electrodes are placed over the lower eyelids under red light (Figure 1). These do not hurt!. The electrical responses to flashes of different colours and increasing brightness are then recorded in the dark via the electrodes.

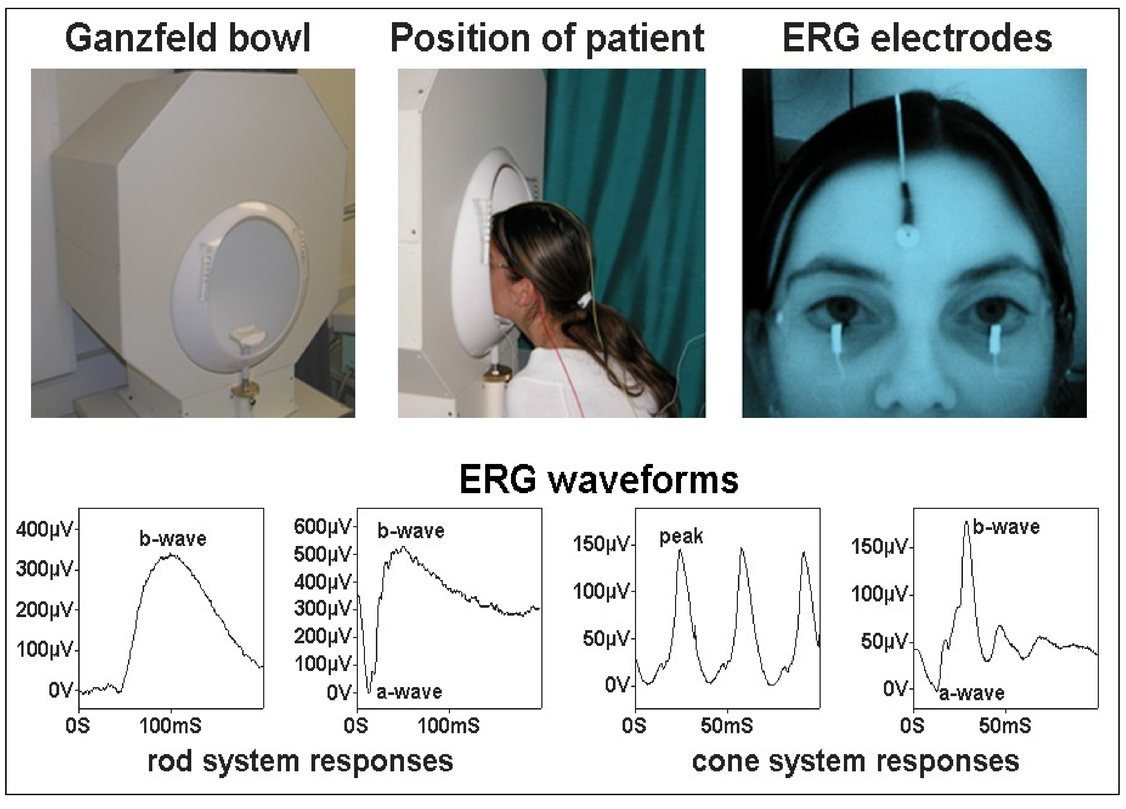
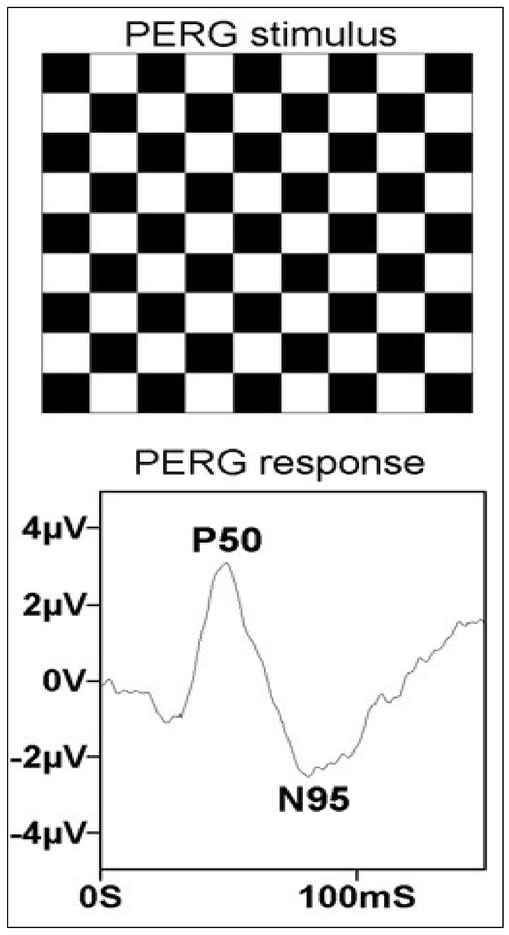


Figure 1. The Electroretinogram (ERG)

TEST 2: The Pattern Electroretinogram (PERG)



The PERG measures the function of the central part of the retina called the macula. The macula, although a relatively small area, is used for detailed vision such as reading and watching television.

The same electrodes are used for the PERG as for the ERG (Figure1). The patient is asked to look at a moving checkerboard pattern on a television screen (Figure 2), and the very small responses from the macula are recorded via the electrodes.

Figure 2. The checkerboard stimulus (top) used to record the PERG. The PERG electrical signal is shown on the bottom.

TEST 3: The Visual Evoked Potential (VEP)

The VEP measures the small responses produced by the visual centres of the brain in response to visual stimulation. This enables assessment of the nerves which connect the eye to the brain and the areas of the brain responsible for vision.

Figure 3. The flash lamp and controller to record the flash VEP.

Small disc electrodes are placed on the head with water soluble paste. The patient is asked to look either at a moving checkerboard pattern (similar to Figure 2), or a flashing light (Figure 3), and the electrical responses generated are recorded via the electrodes.

TEST 4: The Electro-oculogram (EOG)

The EOG measures the function of the retinal pigment epithelial layer, which is at the back of the eye and provides nutrients to the rods and cones. Small disc electrodes are placed on both sides of the patient’s eyes. The patient is then asked to make regular eye movements and the movements of the eyes are recorded via the electrodes at the sides of the eyes.

What should I expect on the day?

It can take up to three hours to complete all the tests, but they are all non-invasive, and it is only very rarely necessary to use numbing drops in the eye. There are no injections into the eye or arm. The drops used to dilate the pupils may cause a slight stinging sensation for a few seconds and vision will be blurred for a few of hours after testing so you should not drive during that time. Dark glasses may help on a sunny day. Patients having a VEP usually wish to wash their hair when they get home. The tests will be carried out by Clinical Physiologists. The results will be interpreted by Consultant Electrophysiologists and a report sent to the clinician who referred the patient.

If you require any further information regarding the department or the tests please contact us on **020 7566 2120**.