

Lab 11 – Electrodiagnostic Testing: the ERG

OVERVIEW OF ELECTRODIAGNOSTICS

The visual system uses electrical impulses to transmit data, therefore one way to assess its health is to measure its electrical activity. The three major types of electrodiagnostic tests are summarized in the Table below. The EOG test is not done frequently, but we run the VER and ERG test on patients regularly. These are the ones we'll emphasize in lab today.

Test	What measured?	Tests ...
EOG	Electrical charge of the eye ball	Some retinal diseases (not used much)
ERG	Electrical response of the retina	Peripheral retinal diseases; RP, etc.
VEP/VER	Electrical response of area V1	Fovea to occipital pole pathways; optic neuritis, etc.

ELECTRORETINOGRAM (ERG)

The **standard ERG** floods the entire retina with a single or multiple flashes and is most useful for detecting diseases of the **peripheral retina**, such as retinitis pigmentosa. Since the fovea occupies a very small area of the retina, it contributes little to the ERG. Figure 1, below, shows a typical ERG response to a single bright flash of light. The negative **a-wave** is associated with the photoreceptors. The **b-wave** comes from the Müller (neuroglial) cells and the photoreceptors. The response to a flicker is a repeating series of waves. Depending on stimulus conditions (dark/light adaptation, stimulus color, duration, etc.), the ERG trace may show the response of either rods or cones or both.

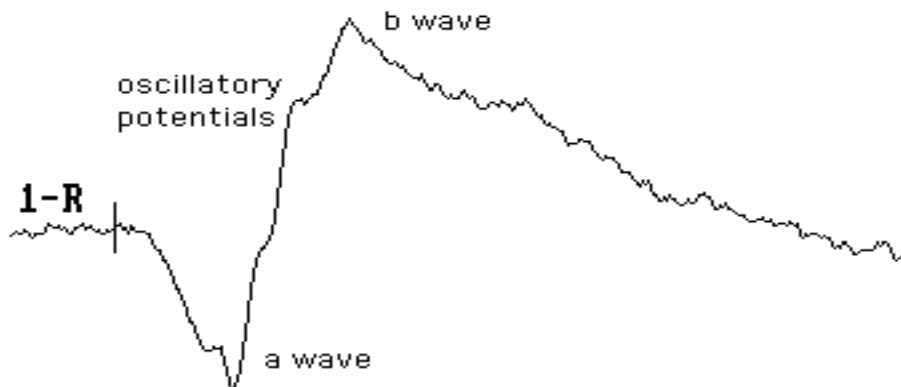


Figure 2. Typical ERG.

Lab procedures We will follow a standardized ERG procedure that runs five tests, each under different conditions.

Materials: Surgical tape, tissue paper, cotton swabs, alcohol pads, skin prep fluid (Omni Prep), electrode gel or fluid, proparacaine, red lamp, forehead electrode with cable splitter, ear clip electrode, two contact lens electrodes.

Patient preparation: Dilate and dark adapt the patient for for 20+ minutes. Place electrodes as follows:

- a. Prep and attach the forehead electrode. Connect the split ends to 1- and 2-.
- b. Prep and attach the ear-clip electrode. Connect the free end to either ground.
- c. Instill proparacaine and insert the right and left contract lens electrodes. Tape the wires to the cheeks. Connect the right electrode to 1+ and the left to 2+.

Computer settings: Starting from the main menu, select: TESTS/ ELECTRORETINOGRAM/ STANDARD. Enter patient information; It is possible to run each eye separately (1 channel) or both at the same time (2 channels). Select the eye or eyes and continue.

Test procedure: The room should be dark except for a red light. Place the patient's chin in the Ganzfeld. Check the electrical baseline. The presence of a periodic (non-random) baseline waveform indicates poor electrode placement. Run the standard five step protocol:

Step 1. Scotopic, faint (-25 dB) white flash. Rod only response. You should see a b-wave only. Store and step forward.

Step 2. Brighter (0 dB) white flash; stimulates rods and cones. The a- and b-waves appear. Store and step forward.

Step 3. Same stimulus. Magnifies oscillatory potentials on the b wave; tests for retinal ischemia. Store and step forward.

Step 4. Light adapt 3-10 minutes to bleach rods; cone only response. Brighter (0 dB) white flash. Store and step forward.

Step 5. Flicker ERG (30 Hz). Still light adapted, so testing cone function.