TEST

Electroretinography

Electroretinography records how the light-sensitive cells in your retina respond to light

WHAT IT MEASURES
Electrical responses of retinal cells to light

SAMPLE
None; electrodes record signals from the eyes

FASTING NEEDED?
No, unless sedation is planned

HOW LONG IT TAKES
About one to two hours, depending on test type

RESULTS IN
Several days to weeks; varies by laboratory

USED FOR
Diagnosing and monitoring retinal disorders

MAIN LIMITATION
Results rely on correct setup, clear eye media, and cooperation

Overview

Electroretinography, or ERG, records electrical signals produced by the retina when it is exposed to light. The retina is the light-sensitive layer at the back of your eye.

The test mainly assesses rods and cones. Rods help you see in dim light, while cones support daylight, detailed, and colour vision. Other retinal cells may also contribute to the recording.

ERG does not measure eyesight in the same way as an eye chart. It shows how retinal cells respond under controlled conditions. The results appear as waves on a graph.

Several forms of ERG are available:

The type used depends on the question your eye specialist is trying to answer.

- Full-field ERG measures the combined response of most of the retina
- Multifocal ERG maps responses from many small areas, mainly in the central retina
- Pattern ERG uses a changing checkerboard or similar pattern to assess central retinal and related cell function

Why the test is ordered

ERG may be ordered when an eye examination, scan, family history, or symptoms suggest that retinal cells may not be working normally. It can help investigate reduced night vision, unexplained loss of vision, light sensitivity, or changes in colour vision.

The test is often used when an inherited retinal condition is suspected. These conditions are caused by changes in genes and may affect rods, cones, or both.

ERG can also help:

An ERG result usually forms one part of an eye assessment. It is not normally used as a general vision screening test.

- Separate widespread retinal dysfunction from problems affecting only the macula, optic nerve, or brain
- Assess retinal function when the eye's appearance does not fully explain reduced vision
- Monitor selected retinal conditions or possible medicine-related retinal effects
- Support decisions about further imaging or genetic testing

Who should have the test

You may be offered ERG if your eye specialist needs information about retinal function that cannot be obtained from an eye chart, examination, or scan alone.

Children can have ERG, including children who cannot describe what they see. Younger children may need extra support to remain still. Sedation or anaesthesia is sometimes used when a reliable recording would otherwise be difficult.

ERG is not needed for every retinal problem. Optical coherence tomography, known as OCT, photographs or other scans may provide more useful information when the main question concerns retinal structure rather than function.

How to prepare

Follow the instructions from the testing centre because preparation differs between full-field, multifocal, and pattern ERG.

You can usually eat and drink normally. Fasting may be required if sedation or anaesthesia is planned. In that situation, use the specific fasting instructions you receive.

Tell the clinic about your medicines, eye drops, allergies, previous reactions to dilating drops, and whether you are pregnant or could be pregnant. Do not stop prescribed medicines unless the clinician arranging the test tells you to.

You may be asked to:

Dilating drops can cause blurred near vision and sensitivity to bright light for several hours. Sunglasses may make the journey home more comfortable.

- Remove contact lenses before testing
- Avoid eye makeup, face creams, or oily products around the eyes
- Bring your glasses for a pattern or multifocal test
- Arrange transport home if your pupils will be dilated

What happens during the test

The exact procedure depends on the type of ERG.

For a full-field ERG, drops are usually used to widen your pupils. You may then sit in darkness for about 20 minutes so your eyes can adapt. This allows the test to measure rod responses under dim conditions.

Small electrodes are placed on the skin near your eyes and forehead. A recording electrode may be a soft contact lens, a fine fibre, or a thin strip placed along the lower eyelid. Numbing drops are often used before an electrode touches the eye.

You look into a bowl-shaped device while flashes of different brightness are presented. Part of the test is performed after your eyes have adapted to light so cone responses can be assessed.

For multifocal or pattern ERG, you usually look at a screen displaying changing shapes or a checkerboard. You need to focus on a central target. The test may be repeated if blinking, eye movement, or loss of focus affects the recording.

The flashes may look bright, but they should not be painful. Tell the person carrying out the test if the electrode becomes uncomfortable or you need a break.

Understanding your results

ERG results are waveforms rather than a single number. The main features are the size of each response, called its amplitude, and how quickly it appears after the light stimulus, called its

timing.

A smaller or delayed response may suggest that some retinal cells are not responding as expected. The pattern can help show whether rods, cones, or particular retinal areas are more affected.

A normal full-field ERG means the combined response from most of the retina was within the laboratory's expected limits. It does not rule out every eye condition. A small area of retinal damage, a macular condition, an optic nerve disorder, or a problem in the brain's visual pathways may still be present.

There is no single universal normal range for every ERG system. Reference ranges and interpretation vary by laboratory, equipment, test protocol, age, sex, pregnancy status, medicines, and clinical context. Your results should be interpreted alongside your symptoms, eye examination, scans, family history, and previous results.

What affects the results

Several factors can change the recording even when the testing equipment is working correctly.

Poor contact between the electrode and the eye can make signals look smaller or noisier. Blinking, eye movement, squeezing the eyelids, or difficulty keeping your gaze on a target can have a similar effect.

Other important influences include:

Some medicines and retinal diseases genuinely alter retinal function rather than merely interfering with the test. Give the clinic a complete medicine list so this can be considered.

If a recording is technically poor, parts of the test may need to be repeated. This does not by itself mean that your retina is abnormal.

- Incomplete dark or light adaptation
- Pupils that are not fully dilated when dilation is required
- Cataracts, corneal clouding, or blood in the eye blocking light
- Incorrect glasses correction during pattern-based testing
- Recent exposure to bright light before dark-adapted testing
- Sedation or anaesthetic medicines
- Age and the laboratory's equipment and recording method

Accuracy and limitations

ERG is a well-established way to measure retinal electrical function when standardised equipment and methods are used. However, it is not a simple positive-or-negative test, and there is no single accuracy figure that applies to every retinal condition.

A full-field ERG can miss a disorder limited to a small retinal area because healthy parts of the retina may dominate the combined signal. Multifocal ERG or OCT may be more useful for a localised macular problem.

The test can also appear abnormal when retinal function is not the main problem. Poor electrode contact, reduced attention, eye movement, media clouding, or incomplete adaptation can reduce responses. Repeating a questionable recording can help determine whether the finding is genuine.

ERG does not usually identify the exact genetic cause of an inherited condition. Genetic testing may be needed for that. Visual field testing, OCT, fundus imaging, electro-oculography, or visual evoked potential testing may be better suited to other questions about vision.

Risks and complications

ERG is generally low risk. The electrode may cause temporary watering, irritation, or a gritty feeling, and there is a small risk of a scratch on the cornea, the clear front surface of the eye.

Dilating drops commonly cause temporary blurred near vision and light sensitivity. Seek urgent eye care if dilation is followed by severe eye pain, marked redness, persistent blurred vision, coloured rings around lights, headache, nausea, or vomiting.

Sedation or anaesthesia has separate risks. These should be discussed with the team arranging it.

What happens next

A specialist reviews the waveforms and checks whether the recording was technically reliable. The report is then considered with your other eye test results.

Routine next steps may include an eye clinic appointment, repeat ERG, retinal imaging, visual field testing, or genetic testing. Monitoring may be recommended when the purpose was to track an existing condition or medicine exposure.

Contact the clinic routinely if you have not received results within the timeframe you were

given.

ERG itself does not cause delayed vision loss. However, sudden loss of vision, a new curtain or shadow across your sight, many new floaters or flashes, or severe eye pain requires urgent eye assessment rather than waiting for an ERG report.

Common questions

Can I drink coffee before an ERG?

Usually, yes. Coffee does not normally interfere with ERG. Follow different instructions if you will receive sedation or have been asked to fast.

Can I exercise beforehand?

Ordinary exercise is not known to be a major source of ERG error. Avoid arriving overheated or exhausted if that would make it difficult to sit still and focus.

Does the time of day matter?

Standardised adaptation and testing conditions are usually more important than the clock time. For repeat monitoring, the clinic may use similar conditions each time.

Can I drive home afterward?

Driving may be unsafe while your pupils are dilated because near vision can be blurred and bright light may be uncomfortable. Ask whether dilation is planned and arrange transport if needed.

Can I wear contact lenses?

You will usually need to remove them before the test, particularly if a recording electrode will touch the eye. Bring a lens case and your glasses.

Is electroretinography painful?

Most people notice bright flashes, mild pressure, watering, or a gritty feeling rather than pain. Tell the tester immediately if you have significant discomfort.

Sources

- McCulloch DL, et al. ISCEV Standard for full-field clinical electroretinography, 2022 update . Documenta Ophthalmologica . 2022;144:165-177.

- Robson AG, et al. ISCEV guide to visual electrodiagnostic procedures . Documenta Ophthalmologica . 2018;136:1-26.
- Hoffmann MB, et al. ISCEV standard for clinical multifocal electroretinography, 2021 update . Documenta Ophthalmologica . 2021;142:5-16.
- Bach M, et al. ISCEV standard for clinical pattern electroretinography, 2012 update . Documenta Ophthalmologica . 2013;126:1-7.
- U.S. National Library of Medicine. Electroretinography . MedlinePlus Medical Encyclopedia . Accessed August 11, 2026.