KAISER PERMANENTE®

**Kaiser Foundation Health Plan of Washington**

# *Clinical Review Criteria*
# Electroretinography



## Criteria

### For Medicare Members

| Source | Policy |
|---|---|
| CMS Coverage Manuals | None |
| National Coverage Determinations (NCD) | None |
| Local Coverage Determinations (LCD) | None |
| Local Coverage Article (LCA) | None |
| Kaiser Permanente Medical Policy | Due to the absence of an active NCD, LCD, or other coverage guidance, Kaiser Permanente has chosen to use their own Clinical Review Criteria, ***"Electroretinography"*** for medical necessity determinations. Use the Non-Medicare criteria below. |

### For Non-Medicare Members

There is insufficient evidence in the published medical literature to show that this test provides better long-term outcomes than current standard services/therapies.

**If requesting review for this service, please send the following documentation:**

- Last 6 months of clinical notes from requesting provider &/or specialist

The following information was used in the development of this document and is provided as background only. It is provided for historical purposes and does not necessarily reflect the most current published literature. When significant new articles are published that impact treatment option, Kaiser Permanente will review as needed. This information is not to be used as coverage criteria. Please only refer to the criteria listed above for coverage determinations.

## Background

Liutkevičienė et al., 2012:
During electroretinography (ERG), a total retinal response to light stimulus is recorded. ERG is comprised by a and b-waves which are generated by the outer segments of photoreceptors and Muller cells respectively. B-wave represents activities in the inner retinal layers. Several stimulations and registration techniques help record potentials of various retinal structures: early receptor potential, ERP; standard electroretinogram of full field by ISCEV (International Society for Clinical Electrophysiology of Vision); photopic negative response, PhNR; pattern (alternating contrast) ERG, pERG; multifocal ERG (mfERG).

Dettoraki et al., 2016:
Multifocal electroretinography (mfERG)
Multifocal electroretinography (mfERG) is an objective evaluation of visual function. It is noninvasive and assesses retinal diseases. During mfERG, several areas of the retina are stimulated but each response is recorded independently. mfERG measures the electrophysiological activity of the retina. Under the influence of light, retinal responses are recorded, permitting diagnosis of retinal abnormality.


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The stimulation of the retina is done by hexagonal elements alternating between black and white. Similar to full-field ERG, a corneal electrode records electrical response of the retina which consists of waveforms. The waveforms include three responses: an initial negative response (N1), a positive response (P1) and a second negative response (N2). These responses represent the function of the external layer of the retina (photoreceptors and bipolar cells). The location of the stimulus and anatomical areas correspond to the fovea, parafovea, perifovea, and periphery. mfERG can show the amplitudes of the signal.

Many factors can alter the waveforms. These include unstable electrode contact, poor fixation, continuous blinking, and errors in refraction.

mfERG detects abnormalities of the macula, peri-macular area and the mid peripheral zone of the retina which are not always seen on fundoscopy, such as chloroquine (CQ) or hydroxychloroquine (HCQ) toxicity, siderosis, anorexia nervosa, tilted disk syndrome and keratoconus. mfERG can assess drug- induced retinal toxicity. In addition, mfERG can detect central lesion in all macular diseases (age-related macular degeneration, central serous chorioretinopathy, vitelliform maculopathy, macular hole, juvenile retinoschisis and other diseases). Further, mfERG can estimate the degree of central lesion in early stages of Stargardt's maculopathy and toxic maculopathy. The combination of mfERG and visual evoked potentials (VEPs) is beneficial in the differential diagnosis of retinal and optic nerve diseases.

Another type of mfERG is wide-field (WF)-mfERG that targets peripheral areas of the retina. The testing field of WF-mfERG is 90 degree versus 45 degree for conventional mfERG. WF-mfERG is useful in detecting abnormality of retina in retinitis pigmentosa, retinal vein occlusion, birdshot chorioretinitis and vigabatrin toxicity.

Retinal toxicity
Although not frequent, drug-induced ocular toxicity must be detected early to avoid permanent vision loss. There are several medications that can cause ocular toxicity. The most frequent affecting the retina include chloroquine (CQ) and hydroxychloroquine (HCQ), vigabatrin (VGB), deferoxamine, ethambutol, interferon-α, tamoxifen, digoxin, sildenafil, canthaxanthin, amiodarone and nefazodone. Evaluation of retinal toxicity is founded on medical history and ophthalmic examination. However, other investigations including mfERG, optical coherence tomography (OCT), fundus autofluorescence (FAF), perimetry, and fundus angiography are also valuable. The sensitivity and specificity of these tests are not clear. Symptoms of CQ or HCQ retinopathy include blurred vision, photophobia, scotomas, and difficulty reading. The fundus is described as "bull's eye maculopathy".

Whatham 2013:
Full-field ERG stimulates the central and peripheral visual fields with flashlight. Pupils are dilated and response to the stimulation is assessed under dark-adapted and light-adapted conditions. The International Society for Clinical Electrophysiology of Vision (ISCEV) recommends a minimum of 20 minutes dark adaptation to produce a dark adapted (scotopic) state of sensitivity and a minimum of 10 minutes adaptation to a background luminance of 30 cd/m2 to produce a light-adapted (photopic) state of visual sensitivity. Full-filled ERG detects a range of retinal dysfunction, such as rod-cone dystrophy. Full- field ERGs are normal in focal retinal diseases including age-related macular degeneration and Stargardt's disease.

https://eyewiki.org/Electroretinogram:
The pattern ERG (PERG) uses the same stimuli, pattern-reversal stimuli, that is used in visual evoked potential (VEP). PERG records retinal ganglion cell activity and may detect optic neuropathies.
One difference between full-field ERG and mfERG is that in full-field ERG, the recording is a massed potential from the whole retina. Multifocal ERGs can map small scotomas in the central 40+ degrees of visual field (Creel, 2019). Full-field ERGs are used to record the global health of the retina, such as in retinitis pigmentosa (Creel, 2019).

## Medical Technology Assessment Committee (MTAC)

***Electroretinography (ERG)***
**7/13/2020: MTAC REVIEW**
**Evidence Conclusion:**
**HCQ-induced retinopathy**: A systematic review and meta-analysis of studies with high risk of bias shows that mfERG has a high sensitivity and variable specificity. In addition, accuracy of mfERG improves with older age, increased HCQ dose, and longer duration of treatment. mfERG may detect retinal toxicity earlier than other tests.


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**Metallic foreign bodies**: There is insufficient evidence to assess ERG and retinal toxicity from metallic foreign bodies. The literature is comprised of case reports and case series. However, the trend from available evidence shows that ERG detected abnormalities in patients with intraocular metallic foreign bodies prior to surgery with improvement after removal of the foreign bodies.
**Retinitis pigmentosa**: Several studies show decreased amplitude of ERG and delayed implicit time in patients with retinitis pigmentosa. This suggests that ERG detects abnormalities in this population. Clinical validity was not reported and comparison with electro-oculogram or visual evoked potential (VEP) was rare. However, there is correlation between mfERG and corresponding mfVEP. Further, ERG may be useful in allowing long-term follow-up of disease progression in retinitis pigmentosa. mfERG may add to the diagnostic information of several patients with retinitis pigmentosa. ERG may distinguish between HCQ-induced retinal toxicity and retinitis pigmentosa. The evidence is comprised of case series and case reports with small sample sizes.
**Cone-Rod dystrophy**: Studies assessing clinical validity were not identified. The evidence is comprised of case reports or case series or retrospective study showing that ERG may detect cone-rode dystrophy and be useful to monitor disease progression.
**Leber's congenital amaurosis, congenital stationary night blindness, achromatopsia:** The evidence is insufficient to assess the accuracy of ERG in these diseases.

**Articles:** See Evidence Table

The use of Electroretinography (ERG) does not meet the *Kaiser Permanente Medical Technology Assessment Criteria.*

## Applicable Codes

**Considered Not Medically Necessary- experimental, investigational or unproven:**

| CPT® Codes | Description |
|---|---|
| **92273** | Electroretinography (ERG), with interpretation and report; full field (ie, ffERG, flash ERG, Ganzfeld ERG) |
| **92274** | Electroretinography (ERG), with interpretation and report; multifocal (mfERG) |
| **0509T** | Electroretinography (ERG) with interpretation and report, pattern (PERG) |

***Note:** Codes may not be all-inclusive. Deleted codes and codes not in effect at the time of service may not be covered.

****To verify authorization requirements for a specific code by plan type, please use the **Pre-authorization Code Check**.



| Date Created | Date Reviewed | Date Last Revised |
|---|---|---|
| 09/01/2020 | 09/01/2020 MPC, 09/07/2021 MPC, 09/06/2022MPC , 09/05/2023MPC , 03/12/2024MPC, 03/04/2025MPC | 09/01/2020 |

MPC Medical Policy Committee

| Revision History | Description |
|---|---|
| 09/01/2020 | MPC approved to endorse a non-coverage policy for electroretinography. Requires 60-day notice, effective date 02/01/2021. |


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