Electrocochleogram and Perilymphatic Pressure Measurement

Number: 0564

Policy
Aetna considers electrocochleography (ECOG) medically necessary for evaluation of members with symptoms of episodic dizziness (vertigo, imbalance) or tinnitus, to rule out endolymphatic hydrops (Meniere's disease) and perilymphatic fistula.

Aetna considers ECOG medically necessary when performed with auditory brainstem response (ABR) testing of members with profound hearing loss.

Aetna considers ECOG experimental and investigational for routine screening of hearing impairment, and for all other indications because of insufficient evidence of its clinical value for these indications.

Aetna considers the use of intra-operative ECOG for evaluation of cochlear trauma during cochlear implantation experimental.
and investigational because of insufficient evidence.

Aetna considers measurement of perilymphatic pressure experimental and investigational because its value in the management of individuals with Meniere's disease or idiopathic sudden sensorineural hearing loss has not been established.

**Background**

**Meniere's Syndrome/Endolymphatic Hydrops**

Meniere's disease or Meniere's syndrome is a potentially disabling condition involving varying degrees of fluctuating hearing loss, fluctuating tinnitus, episodic vertigo, and aural fullness (a feeling of fullness, pressure and discomfort in the ear). The syndrome may be idiopathic, in which case it is called Meniere's disease, or secondary to various processes that interfere with the normal resorption of endolymph (e.g., neurosyphilis, viral infections, trauma, congenital anomalies, etc.). The disease appears to strike most commonly persons between 30 and 60 years of age, with men and women affected equally. Incidence of the disease is approximately 250 per million populations. Patients with Meniere's disease have a progressive distention of the endolymphatic space of the inner ear, caused by fluid build-up of the endolymphatic space (endolymphatic hydrops), caused either by overproduction or reduced adsorption. The increased pressure exposes cochlear hair cells responsible for sensing movement and balance to progressive damage and paralysis, resulting in attacks of dizziness, often with nausea and vomiting.

Early in the course of disease, these attacks are usually brief (lasting 1 hour or so), as the damage to the cochlear hair cells is temporary and the hair cells resume normal function when the hydrops resolves. Chronic repetitive attacks may lead to irreversible damage to the hair cells, and hearing loss can become permanent. The hearing loss and tinnitus are usually unilateral, although up to a quarter of patients may go on to develop a severe bilateral disorder.
Trans-tympanic electrocochleography (ECOG) can be used to confirm cochlear involvement in hearing loss, and is an objective test for endolymphatic hydrops. Electrocochleography measures the ratio of the summating potential (SP) and the action potential (AP) on the most peripheral portion of the auditory system in response to auditory stimuli. The AP is the summed or averaged activity of the APs of the auditory nerve, which are elicited by acoustic stimulation. The SP is generated by the hair cells of the cochlea in response to acoustic stimulation. Surface electrodes, such as those used in auditory brainstem response, can not record these potentials; electrodes must be placed on or through the tympanic membrane. In ECOG, a fine needle is passed through an anesthetized tympanic membrane and placed in contact with the cochlear hair cells of the inner ear in order to record electrical activity from these cells. The ear is exposed to a train of about 1,000 click or tonal stimuli, and APs from auditory neurons are recorded for 10 milliseconds after each click. This information is recorded and summated by computer. Patients with endolymphatic hydrops have abnormal waveforms (widening of the waveform with multiple peaks). Endolymphatic hydrops is suggested when the ratio of the summating potential to the AP is greater than 35%.

Electrocochleography allows the diagnosis of Meniere's disease to be confirmed or refuted so that appropriate prognostic advice can be given together with medical or surgical treatments if indicated.

In all patients who have unilateral persistent otological symptoms, a MRI is required to exclude acoustic neuroma, which can mimic the presentation of Meniere's disease. Meniere's is confirmed with an electrocochleogram so that appropriate effective treatments can be applied.

Acute attacks of Meniere's syndrome are treated with anti-emetics and sedatives. Long-term treatment is usually medical, including rigid salt restriction and diuretics. Occasionally chemoablation (intra-tympanic gentamycin) or
surgical ablation (labyrinthectomy when hearing is already lost, vestibular nerve section when it is not) is necessary for refractory disease.

**Perilymphatic Fistula**

Electrocochleography has also been used to determine the presence of perilymphatic fistula, based on the SP/AP amplitude ratio. A perilymph fistula (perilymphatic fistula, labyrinthine fistula) is an abnormal communication between the fluid-filled perilymphatic space of the inner ear and the air-filled middle ear cavity, usually through the round or oval windows. This results in sensori-neural hearing loss and/or vestibular symptoms.

Most commonly, a tear in the round or oval window leads to loss of perilymph into the middle ear. This may be the result of stapes prosthesis surgery, trauma, barotrauma, bony erosion due to infection or neoplasm, or it may be idiopathic. In children, it is associated with congenital anomalies of the middle or inner ear.

Symptoms of perilymphatic fistula are similar to Meniere's disease, and include sensori-neural hearing loss, which may be sudden or fluctuating; aural fullness; and vestibular symptoms (vertigo (with or without head position changes), dysequilibrium, motion intolerance, nausea and vomiting, disorganization of memory and concentration, and perceptual disorganization in complex surroundings (such as crowds or traffic)). Tinnitus occurs in some cases, and can be roaring. In the absence of prior surgery or definite traumatic event, it may be difficult to distinguish a perilymph fistula from Meniere's syndrome.

In addition to ECOG, other tests that may be used by otologists for the diagnosis of perilymph fistula include audiograms to detect hearing loss and fistula tests. The subjective fistula test is performed by applying positive and negative pressure to the intact eardrum using a pneumatic otoscope. Positive results
include the elicitation of nystagmus or onset of dysequilibrium with the sensation of motion or nausea. Some otologists administer the test with electronystagmography or using a specialized platform. Rigid or flexible endoscopy is performed to look for visible tears or fluid in the middle ear. The final diagnosis is made by direct inspection at the time of surgery, with visualization of perilymph fluid in the middle ear cavity.

Medical therapy is rarely reported. There are some reports of spontaneous healing with bedrest, head elevation to 30 degrees, and avoidance of lifting or middle ear pressure-increasing activities. Surgical treatment is available if conservative therapy fails.

**Severe Sensori-Neural Deafness**

Another clinical application of ECOG is identification of wave I of the auditory brainstem response (ABR) during combined ECOG-ABR testing, as wave I is frequently difficult to detect in patients with profound hearing loss when ECOG is not performed in conjunction with ABR testing. Auditory brainstem response testing involves the measurement of responses along the auditory pathway from cranial nerve VIII to the lateral lemniscus of the auditory brainstem. Five distinct electric waveforms generated in the 8th nerve, brainstem, and other regions in response to acoustic stimulation are examined. Wave I is generated at the distal part of the auditory nerve.

**Screening for Hearing Impairment**

According to the U.S. Preventive Services Task Force, ECOG is not an appropriate test for routine screening for hearing impairment.

Electrocochleography is available in virtually all otolaryngology departments, takes only 20 mins or so and requires an otolaryngologist and usually an audiologist.

**Perilymphatic Pressure Measurement**
Assessment of perilymphatic pressure has also been used to diagnose Meniere's disease. However, published reports do not support a diagnostic role for this approach. Rosingh and colleagues (1996) did not find any significant differences in perilymphatic pressure measurements between patients with Meniere's disease and young normal hearing subjects. This is in accordance with the findings of Ayache and associates (2000) who concluded that assessment of perilymphatic pressure does not seem to be useful in Meniere's disease. Furthermore, Rosingh and co-workers (2000) reported that perilymphatic pressure measured in the affected ear of patients with Meniere's disease or idiopathic sudden sensori-neural hearing loss did not differ significantly from the pressure in the non-affected and normal hearing ear. In a follow-up study by Ayache et al (2002), the authors concluded that perilymphatic pressure measurements by means of the Tympanic Displacement Analyzer are not useful in the evaluation of patients with Meniere’s disease.

Intra-Operative Electrocochleography for Evaluation of Cochlear Trauma During Cochlear Implantation

Calloway and colleagues (2014) noted that electrophysiological responses to acoustic stimuli are present in nearly all recipients of cochlear implantation (CI) when measured at the round window (RW). Intra-cochlear recording sites might provide an even larger signal and improve the sensitivity and the potential clinical utility of ECOG. These researchers compared RW to intra-cochlear recording sites and examined if such recordings can be used to monitor cochlear function during CI. Intra-operative ECOG recordings were obtained in subjects receiving CI from the RW and from just inside scala tympani \( n = 26 \). Stimuli were tones at high levels \( 80 \) to \( 100 \) dB hearing level (HL). Further recordings were obtained during insertions of a temporary lateral cochlear wall electrode \( n = 8 \). Response magnitudes were determined as the sum of the 1st and 2nd harmonics amplitudes. All subjects had measurable extra-cochlear responses at the RW; 20 cases \( 78 \% \) showed a larger intra-cochlear response, compared with 3 \( 11 \% \) that had a
smaller response and 3 that were unchanged. On average, signal amplitudes increased with increasing electrode insertion depths, with the largest increase between 15 and 20 mm from the RW. The authors concluded that ECOG to acoustic stimuli via an intra-cochlear electrode is feasible in standard recipients of CI. The increased signal can improve the speed and efficiency of data collection. The growth of response magnitudes with deeper intra-scalar electrode positions could be explained by closer proximity or favorable geometry with respect to residual apical signal generators. These investigators stated that reductions in magnitude may represent unfavorable geometry or cochlear trauma.

Campbell and co-workers (2015) recorded ECOG directly from a cochlear implant in awake recipients with residual hearing, using an adaptation of Neural Response Telemetry (NRT) that achieves a 10-ms recording window. Subjects were adults with CI422 cochlear implants who retained audiometric thresholds between 75 and 90 dB HL at 500 Hz in their implanted ear. The cochlear implant was interfaced to a laptop via a Freedom speech processor connected by USB. Calibrated acoustic stimuli (clicks and tone bursts between 500 and 1,500 Hz) were presented via insert tube phones to the implanted ear. Responses were acquired through the adapted NRT system. Recordings were made from apical, mid-array, and basal electrodes; ECOG responses were compared with audiometric thresholds. Electrocochleography could be recorded from all 5 subjects. The compound action potential, cochlear microphonic, and summating potentials were identified. Good quality recordings were most reliably attained from apical electrodes using 40 to 100 repetitions. Audiometric thresholds were similar to compound action potential thresholds. The authors concluded that intra-cochlear responses to acoustic stimulation can be recorded directly from the CI in awake recipients with residual hearing; they stated that this may prove useful for monitoring post-operative hearing and for device fitting.

In a prospective, cohort study, Adunka and colleagues (2016)
stated that previous reports have documented the feasibility of utilizing ECOG responses to acoustic signals to assess trauma caused during CI. The hypothesis is that intra-operative RW ECOG before and after electrode insertion will help predict post-operative hearing preservation outcomes in recipients of CI. Intra-operative RW ECOG responses were collected from 31 CI recipients (14 children and 17 adults) immediately before and just after electrode insertion. Hearing preservation was determined by post-operative changes in behavioral thresholds. On average, the post-insertion response was smaller than the pre-insertion response by an average of 4 dB across frequencies. However, in some cases (12 of 31) the response increased after insertion. The subsequent hearing loss was greater than the acute loss in the ECOG, averaging 22 dB across the same frequency range (250 to 1,000 Hz). There was no correlation between the change in the ECOG response and the corresponding change in audiometric threshold. The authors concluded that intra-operative ECOG is a sensitive method for detecting electrophysiological changes during CI; but had limited prognostic value regarding hearing preservation in the current conventional CI patient population where hearing preservation was not intended.

Dalbert and associates (2016) evaluated cochlear trauma during CI by ECOG and cone beam computed tomography (CBCT) and correlated intra-operative cochlear trauma with post-operative loss of residual hearing. Electrocochleography recordings to tone bursts at 250, 500, 750, and 1,000 Hz and click stimuli were recorded before and after insertion of the cochlear implant electrode array, using an extra-cochlear recording electrode. Cone beam CTs were conducted within 6 weeks after surgery. Changes of intra-operative ECOG recordings and CBCT findings were correlated with post-operative threshold shifts in pure-tone audiograms (PTAs). A total of 14 subjects were included. In 3 subjects a decrease of low-frequency ECOG responses at 250, 500, 750, and 1,000 Hz occurred after insertion of the electrode array. This was associated with no or minimal residual hearing 4 weeks after surgery. Electrocochleography responses to click stimuli were present in
6 subjects and showed a decrease after insertion of the electrode array in 3. This was associated with a mean hearing loss of 21 dB in post-operative PTAs. Scalar dislocation of the electrode array was assumed in 1 subject because of CBCT findings and correlated with a decrease of low-frequency ECOG responses and a complete loss of residual hearing. The authors concluded that hearing loss of less than or equal to 11 dB was not associated with detectable decrease in ECOG recordings during CI. However, in a majority of patients with threshold shifts of greater than 11 dB or complete hearing loss, an intra-operative decrease of high- or low-frequency ECOG signals occurred, suggesting acute cochlear trauma.

### CPT Codes / HCPCS Codes / ICD-10 Codes

**Information in the [brackets] below has been added for clarification purposes.**  
*Codes requiring a 7th character are represented by "+":*

**ICD-10 codes will become effective as of October 1, 2015:**

**CPT codes covered if selection criteria are met:**

- 92584 Electrocochleography

**Other CPT codes related to the CPB:**

- 70540 Magnetic resonance (e.g., proton) imaging, orbit, face, and/or neck; without contrast material(s)
- 70542 with contrast material(s)
- 92585 Auditory evoked potentials for evoked response audiometry and/or testing of the central nervous system; comprehensive
- 92586 limited
- 92587 Evoked otoacoustic emissions; limited (single stimulus level, either transient or distortion products)
- 92588 comprehensive or diagnostic evaluation (comparison of transient and/or distortion product otoacoustic emissions at multiple levels and frequencies)
### ICD-10 codes covered if selection criteria are met:

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<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tr>
<td>H81.01 - H81.09</td>
<td>Meniere's disease</td>
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<td>H81.10 - H81.13</td>
<td>Vertigo</td>
</tr>
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<td>H81.13 - H81.49</td>
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<tr>
<td>H83.11 - H83.19</td>
<td>Labyrinthine fistula</td>
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<td>H83.3X1 - H83.3X9</td>
<td>Noise effects on inner ear</td>
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<tr>
<td>H90.3</td>
<td>Sensorineural hearing loss, bilateral</td>
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<tr>
<td>H90.41 - H90.42</td>
<td>Sensorineural hearing loss, unilateral, with</td>
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<td></td>
<td>unrestricted hearing on the contralateral side</td>
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<td>H90.5</td>
<td>Unspecified sensorineural hearing loss</td>
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<td>H90.6 - H90.8</td>
<td>Mixed conductive and sensorineural hearing loss</td>
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<td>H91.20 - H91.23</td>
<td>Sudden idiopathic hearing loss</td>
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<tr>
<td>H91.8X1 - H91.8X9</td>
<td>Other specified hearing loss</td>
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<tr>
<td>H93.11 - H93.19</td>
<td>Tinnitus</td>
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<tr>
<td>R26.89</td>
<td>Other abnormalities of gait and mobility [imbalance]</td>
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<td>R42</td>
<td>Dizziness and giddiness</td>
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### ICD-10 codes not covered for indications listed in the CPB (not all-inclusive):

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<tr>
<td>Z01.10</td>
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<td>without abnormal findings [routine screen without</td>
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<td>Z01.110</td>
<td>Encounter for hearing examination following</td>
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<td>failed hearing screening [routine screen without</td>
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<td>signs/symptoms]</td>
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The above policy is based on the following references:

**Electrocochleogram**


22. Campbell L, Kaicer A, Briggs R, O'Leary S. Cochlear


Perilymphatic Pressure Measurement


AETNA BETTER HEALTH® OF PENNSYLVANIA

Amendment to
Aetna Clinical Policy Bulletin Number: 0564
Electrocochleogram and Perilymphatic pressure Measurement

There are no amendments for Medicaid.

www.aetnabetterhealth.com/pennsylvania
Updated 01/2017