Balloon Dilation of the Eustachian Tube

Effective: April 1, 2018

Next Review: March 2019
Last Review: March 2018

IMPORTANT REMINDER

Medical Policies are developed to provide guidance for members and providers regarding coverage in accordance with contract terms. Benefit determinations are based in all cases on the applicable contract language. To the extent there may be any conflict between the Medical Policy and contract language, the contract language takes precedence.

PLEASE NOTE: Contracts exclude from coverage, among other things, services or procedures that are considered investigational or cosmetic. Providers may bill members for services or procedures that are considered investigational or cosmetic. Providers are encouraged to inform members before rendering such services that the members are likely to be financially responsible for the cost of these services.

DESCRIPTION

Balloon dilation of the Eustachian tube is a tuboplasty procedure intended to improve the patency of the cartilaginous Eustachian tube. During the procedure, a saline-filled balloon catheter is introduced into the Eustachian tube through the nose using a minimally invasive transnasal endoscopic method. Pressure is maintained for approximately two minutes after which the balloon is emptied and removed. The procedure is usually performed under general anesthesia.[1,2]

MEDICAL POLICY CRITERIA

Balloon dilation of the eustachian tube is considered investigational for the treatment of any condition, including but not limited to chronic eustachian tube dilatory dysfunction.

NOTE: A summary of the supporting rationale for the policy criteria is at the end of the policy.

CROSS REFERENCES

1. Balloon Ostial Dilation for Treatment of Sinusitis, Surgery, Policy No. 153
BACKGROUND

EUSTACHIAN TUBE FUNCTION

The Eustachian tube (ET) connects the middle ear space to the nasopharynx. It is approximately 36 mm long in adults. The ET ventilates the middle ear space to equalize pressure across the tympanic membrane, clears mucociliary secretions, and protects the middle ear from infection and reflux of nasopharyngeal contents.\[^{3}\] The tube opens during swallowing or yawning.

Eustachian tube dysfunction (ETD) occurs when the functional valve of the ET fails to open and/or close properly. This failure may be due to inflammation or anatomic abnormalities. ET dilatory dysfunction (ETDD) is most commonly caused by inflammation including rhinosinusitis and allergic rhinitis. ETDD can cause symptoms such as muffled hearing, ear fullness, tinnitus, and vertigo.\[^{4}\] Chronic ETDD can lead to hearing loss, otitis media, tympanic membrane perforation, and cholesteatomas.

EPIDEMIOLOGY OF ETD

The epidemiology of ETD, including incidence and prevalence of the disorder and associated symptoms in the community, primary care, and referral populations, is not well-characterized. Data are also lacking to describe the natural history of the disorder and impact on patient functioning.

DIAGNOSIS AND OUTCOME MEASURES

There are no comprehensive guidelines regarding the diagnosis of ETD. Schilder (2015) published a consensus statement from an international group of scientists and physicians with expertise in Eustachian tube disorders, prompted by a Health Technology Assessment from the UK National Institute of Health and Research stating that an important limitation with available evidence for treatments of ETD is a lack of consensus on the definition and diagnosis.\[^{3}\] The meeting was funded by Acclarent, a manufacturer of a dilation technology. The following summarize relevant 2015 consensus statements from the group.

- There is no universally accepted set of patient-reported symptom scores, functional tests, or scoring systems to diagnose ETD.
- Diagnosis of ETDD should consider patient-reported symptoms along with evidence of negative pressure in the middle ear assessed by clinical assessment.
- Transient ETD is ETD with symptoms and signs lasting less than 3 months while chronic ETD is ETD with symptoms and signs lasting for more than 3 months.
- Future clinical trials should include outcomes related to patient-reported symptoms, otoscopy, tympanometry, and pure-tone audiometry, and outcomes should be assessed at baseline, in the short term (6 weeks to 3 months) and in the long term (6-12 months).
- The 7-item Eustachian Tube Dysfunction Questionnaire (ETDQ-7) is the only patient-reported outcome scale to have undergone initial validation studies.

Tympanometry is a frequently used outcome measure in ETD. Tympanometry measures the mobility of the tympanic membrane and graphically displays results in tympanograms.
Tympanograms are classified by the height and location of the tympanometric peak. They are classified into three general patterns: type A indicates normal middle ear and ET function; type B indicates poor tympanic membrane mobility (“flat” tympanogram); and type C indicates the presence of negative middle ear pressure.[5]

The ETDQ-7 is used to assess ETD-related symptoms such as pressure, pain, “clogged” ears, and muffled hearing over the previous month. The 7 items are rated by patients on a 7-level scale from 1 (no problem) to 7 (severe problem). The overall score is reported as a mean item score with a range from 1.0 to 7.0. ETDQ-7 has been shown to be a valid and reliable symptom score for use in adults with ETD with overall score of 2.1 or higher having high accuracy to detect the presence of ETD.[6]

Other important outcomes for evaluating a treatment for ETD are hearing outcomes, otitis media, clearance of middle ear effusion, tympanic membrane retraction, and quality of life. Another important consideration is the need for additional treatment, e.g., additional surgical procedures (including reintervention).

TREATMENT OF ETDD

Medical management of ETDD is directed by the underlying etiology: treatment of viral or bacterial rhinosinusitis; systemic decongestants, antihistamines, or nasal steroid sprays for allergic rhinitis; behavioral modifications and/or proton pump inhibitors for laryngopharyngeal reflux; and treatment of mass lesions. Although topical nasal steroids are commonly used for ETDD, triamcinolone acetonide failed to show benefit in patients ages six and older presenting with otitis media with effusion and/or negative middle ear pressure in a randomized, placebo-controlled, double-blind trial published in 2011.[7]

Patients who continue to have symptoms following medical management may be treated with surgery. Available surgical management includes myringotomy with placement of tympanostomy tubes or eustachian tuboplasty. There is limited evidence supporting use of these surgical techniques.[8] Norman (2014) reported that eustachian tuboplasty (other than balloon dilation) has been evaluated in seven case series and was associated with improvement in symptoms in 36% to 92% of patients with low rates (13%-36%) of conversion to type A tympanogram (which is normal). Myringotomy and tympanostomy have been evaluated in two case series and were associated with symptom alleviation in a subgroup of patients.[6]

REGULATORY STATUS

In December 2015, the AERA® (Acclarent) was granted a de novo 510(k) classification by the U.S. Food and Drug Administration (FDA) (class II, FDA product code: PNZ).[9] The new classification applies to this device and substantially equivalent devices of this generic type. The AERA® is cleared for dilating the Eustachian tube in patients ages 22 and older with persistent ETD.

In April 2017, the XprESS™ ENT Dilation System (Entellus Medical, Plymouth, MN) was cleared for marketing by FDA through the 510(k) process (K163509).[10] FDA determined that this device was substantially equivalent to existing devices for use in Eustachian tube dysfunction. The predicate devices are XprESS™ Multi-Sinus Dilation System and AERA® Eustachian Tube Balloon Dilation System.
EVALUATING THE SAFETY AND EFFECTIVENESS OF BALLOON DILATION OF THE EUSTACHIAN TUBE

Evaluating the safety and effectiveness of balloon dilation of the Eustachian tube requires randomized comparisons with standard treatments. These comparisons are necessary to determine whether the benefits of balloon dilation of the Eustachian tube outweigh any risks and whether they offer advantages over conventional methods with respect to increasing quality of life and decreasing long-term morbidity and mortality, or secondary outcomes such as improved Eustachian tube function. The evidence summary below is focused on systematic reviews (SRs) and randomized controlled trials (RCTs).

Systematic Reviews

The results of two recent SRs and meta-analyses for adults with ETD who were treated with balloon dilation are summarized in Table 1. Huisman (2018)\(^{[11]}\) provided pooled results for 15 case series (n=1155) while Hwang (2016)\(^{[12]}\) provided qualitative summaries only, for nine case series (n=474). Most selected case series provided follow-up of less than a year. All case series reported that patients experienced improvement when comparing symptoms before and after balloon dilation. The selected studies differed with respect to other treatments for ETD used before and after balloon dilation. In Huisman (2018), revisions due to failure of the first ET balloon dilation procedure were reported in three of the 15 studies (n=714); 122 revisions were reported. Huisman (2018) also reported studies had methodological limitations including risk of bias and high heterogeneity and that high quality RCTs are needed.

Table 1. Systematic Review Results

<table>
<thead>
<tr>
<th>Study (Year)</th>
<th>Eustachian Tube Score (Difference, Pre-Post)</th>
<th>Valsalva Maneuvera</th>
<th>Abnormal Tympanic Membrane(^b)</th>
<th>Abnormal Tympanogram (Type B or C)(^c)</th>
<th>Quality of Life (SNOT-22)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Huisman (2018)(^{[11]})</td>
<td>Total N, studies/patients: 3/82</td>
<td>5 /123</td>
<td>6 /144</td>
<td>9 /200</td>
<td>MD=3.94 (2.60 to 5.27) RR=0.13 (0.04 to 0.38) RR=0.38 (0.07 to 2.05) RR=0.47 (0.32 to 0.70)</td>
</tr>
<tr>
<td></td>
<td>Pooled effect (95% CI)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Range of N</td>
<td>8-40</td>
<td>4-40</td>
<td>11-40</td>
<td>4-40</td>
</tr>
<tr>
<td></td>
<td>Range of effect sizes</td>
<td>MD: 3.10-6.40</td>
<td>RR: 0.03-0.50</td>
<td>RR: 0.01-1.00</td>
<td>RR: 07-0.73</td>
</tr>
<tr>
<td>Hwang (2016)(^{[12]})</td>
<td>Range of N(^d)</td>
<td>NR</td>
<td>7-210</td>
<td>NR</td>
<td>7-44</td>
</tr>
<tr>
<td></td>
<td>Summary</td>
<td>Ability to perform improved from 15 (7%) preop to 189 (90%) postop out of 210 patients</td>
<td>135 (95%) ears preop and 55 (39%) postop</td>
<td>SNOT-22 mean score improved from 51.4 to 30 at 6 mo</td>
<td></td>
</tr>
</tbody>
</table>

CI: confidence interval; MD: mean difference; postop: postoperative; preop: preoperative; RR: relative risk; SNOT-22: Sino-Nasal Outcome Test.
\(^a\) The lower the score, the higher the number of patients who can successfully perform a Valsalva maneuver.
\(^b\) Per otoscopy.
Jufas and Patel (2016) published a SR that evaluated balloon dilation, with a transtympanic approach for Eustachian tube dysfunction (ETD).\textsuperscript{13} Three limited case series were included. The authors concluded there was a high risk of bias and safety and efficacy outcomes were conflicting.

Randrup and Ovesen (2015) published a SR evaluating balloon eustachian tuboplasty for ETD.\textsuperscript{14} The authors evaluated nine case series and health outcomes for 443 patients. All case series were poor quality and had a high risk of bias.

**Randomized Controlled Trials**

Poe (2017) published a RCT (n=323) comparing balloon dilation of the Eustachian tube (BDET) with ET balloon catheter (ETBC) plus medical management versus medical management alone. Participants were 22 years or older, had persistent patient-reported symptoms of ETD (ETDQ-7; mean item score, ≥2.1), abnormal tympanometry (type B or type C), and failed medical management including either a minimum of four weeks of daily use of any intranasal steroid spray or a minimum of one course of an oral steroid.\textsuperscript{15} The balloon catheter used in the trial was a custom-designed ET balloon catheter (Acclarent). The RCT results are also described in the AERA (Acclarent) de novo summary from the Food and Drug Administration.\textsuperscript{9} A second RCT (NCT02391584) was described in a single paragraph in the XprESS device 510(k) FDA summary.\textsuperscript{16} However, the results have not been published and the information provided is not sufficient for evaluation.

Poe (2017) investigators were required to perform three successful ETBC procedures in nonrandomized “lead-in” patients who were then followed for durability and safety outcomes. Randomization and analyses were performed at the person-level whether or not the patient had unilateral or bilateral ETD. The primary efficacy outcome (normalization of tympanometry) was assessed by both site investigators and a blinded, independent evaluator; discrepancies were resolved by a second independent evaluator. For bilaterally treated patients, both ears had to be rated as normalized for that patient to be considered normalized for the primary outcome. Patients completed follow-up visits at 2, 6, 12, 24, and 52 weeks but data from the 52-week visit have not been reported. Patients in the medical management arm were allowed to receive BDET after the six-week visit. Trial enrollment was stopped early after the second preplanned look when the prespecified O'Brien-Fleming stopping boundary for the primary outcome was crossed.

At baseline, the mean ETDQ-7 score was 4.7, 43\% of patients had allergic rhinitis, and 61\% of patients had at least one prior ear tube surgery. By the second interim analysis, 162 patients had been assigned to ETBC and 141 were included in analysis; 80 had been assigned to medical management and 72 were included in analysis. Patients were included in analysis if they received the study treatment for which they were randomized and had 6-week follow-up data. Approximately 52\% of ETBC patients experienced tympanogram normalization at 6 weeks compared with 14\% of medical management patients (p<.001). The publication reported that sensitivity analysis was performed to test the robustness of results for the impact of missing data in the analysis cohort versus an intention-to-treat cohort, but the method of sensitivity analyses was not described. It was noted that there was a significant treatment by site interaction. Two sites had a higher percentage of tympanogram normalization for MM subjects than for ETBC subjects while the remaining sites had higher normalization for ETBC.
The pre-specified secondary efficacy outcome (percentage with minimal clinically important difference change of 0.5 points on ETDQ-7) was not reported in the publication but was reported in the FDA summary. The minimal clinically important difference change in ETDQ-7 scores was observed for 91% of ETBC patients at 6 weeks compared with 45% of medical management patients (p not reported). Fifty-six percent of ETBC patients had an ETDQ-7 mean item score of less than 2.1 at six weeks compared with about 9% of medical management patients (p<0.001). See the summary of results in table 2 below.

Comparative analyses were not possible after six weeks because 82% of medical management patients elected to ETBC after 6 weeks. Durability of the effect is supported by analysis of tympanogram normalization in 170 patients with week 24 data (98 randomized to ETBC and 74 from the lead-in); 62% of those randomized to ETBC and 58% of lead-in patients demonstrated tympanogram normalization at 24 weeks. Data from 52 weeks have not been reported.

There were methodological limitations with the Poe (2017) RCT. These included the inability to blind patients, patients were excluded who did not received the assigned treatment, and the study ended prematurely, with only some of the patients evaluated at six weeks. In addition, there were relevance gaps, that prevented the RCT from providing enough evidence to guide treatment for ETDD. These included but are not limited to:

- Patients continued nasal steroids and other medications prescribed prior to the study
- Hearing outcomes were not reported
- Short-term follow-up prevented evaluation of long-term outcomes.

Table 2. Summary of Results for Poe (2017)

<table>
<thead>
<tr>
<th>Study (Year)</th>
<th>Normalization of Tympanometry (% of patients)</th>
<th>ETDQ-7 Symptom Scores &lt;2.1 (% of patients) a</th>
<th>Difference from BL in % Patients With Normal Mucosal</th>
<th>Positive modified Valsalva Maneuver (% ears)</th>
<th>SAEs (no. of events)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poe et al (2017)[15]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time point, wk</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>211</td>
<td>208</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>BDET with ETBC plus MM</td>
<td>52%</td>
<td>56%</td>
<td>+22%</td>
<td>33%</td>
<td>4</td>
</tr>
<tr>
<td>MM</td>
<td>14%</td>
<td>9%</td>
<td>-5%</td>
<td>3%</td>
<td>1</td>
</tr>
<tr>
<td>Tx effect (95% CI)</td>
<td>RR=NR</td>
<td>RR=NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>p</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NNT (95% CI)</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
</tbody>
</table>

BDET: balloon dilation of the Eustachian tube; BL: baseline; CI: confidence interval; ETBC: Eustachian tube balloon catheter; ETDD: Eustachian tube dilatory dysfunction; ETDQ-7: 7-item Eustachian Tube Dysfunction Questionnaire; MM: medical management; NNT: number needed to treat; NR: not reported; RR: relative risk; SAE: serious adverse event; Tx: treatment.

a The prespecified secondary outcome was the proportion of subjects achieving an improvement of at least a minimal clinically important difference of 0.5 points; it was not reported.

Adverse events were only briefly described in the publication but are more fully described in the Food and Drug Administration summary.[9] Two-hundred ninety-nine patients who were treated with ETBC were included in the safety analysis (80 lead-in patients, 149 patients randomized ETBC, 70 patients randomized to medical management who received ETBC). There were 16 nonserious device or procedure-related adverse events in 13 patients—most...
commonly, epistaxis and ETD. Two patients had three potentially device-related adverse events: mucosal tear, worsened ETD, and conductive hearing loss. The potentially device- or procedure-related adverse events were mild or moderate in severity and resolved without sequelae. Five serious adverse events were reported (4 events in the BDET group, one event in the MM group); all were thought to be unrelated to device, procedure, or medication.

Summary

For individuals who have chronic Eustachian tube dilatory dysfunction despite medical management who receive balloon dilation of the Eustachian tube, the evidence includes case series, SRs of case series, and a RCT. Relevant outcome are symptoms, change in disease status, quality of life, and treatment-related morbidity. The criteria for diagnosing Eustachian tube dilatory dysfunction (ETDD) are not standardized. Several medical and surgical treatments are used for ETDD but there is limited evidence for available treatments. Most case series assessed herein provided follow-up of less than a year and all showed short-term improvement comparing symptoms before and after balloon dilation. The number of revision procedures required due to failure of the first Eustachian tube balloon dilation procedure was reported in three case series (n=714); 122 revisions were reported. In the published RCT evaluating balloon dilation of the Eustachian tube, patients were eligible if they reported persistent ETDD symptoms as measured on the 7-item Eustachian Tube Dysfunction Questionnaire (ETDQ-7), a tool to assess symptoms, and had abnormal tympanometry. A greater proportion of patients in the balloon dilation group demonstrated tympanogram normalization (52%) compared with the medical management group (14%) at six weeks and reported reduction in symptoms at six weeks on the ETDQ-7. Durability of effect at 24 weeks was demonstrated in a subset of patients. The rate of adverse events was low and none of the serious adverse events were thought to be related to the device or procedure. The 52-week follow-up data have not been reported. Durability of effect, rates of reoperation or revisions, and safety data over the first year are needed. The evidence is insufficient to determine the effects of the technology on health outcomes.

PRACTICE GUIDELINE SUMMARY

NATIONAL INSTITUTE FOR HEALTH AND CARE EXCELLENCE (NICE)

NICE (2011) published guidance on balloon dilation of the Eustachian tube. The guidance stated: “Current evidence on the efficacy and safety of balloon dilatation of the Eustachian tube is inadequate in quantity and quality.” NICE recommends balloon dilation of the Eustachian tube only be performed for research, to obtain objective data and determine long-term impact on health outcomes.

SUMMARY

There is not enough research to show that balloon dilation of the Eustachian tube improves health outcomes for people with any condition, including chronic Eustachian tube dilatory dysfunction. No clinical guidelines based on research recommend balloon dilation of the Eustachian tube. Therefore, balloon dilation of the Eustachian tube is considered investigational for the treatment of any condition, including but not limited to chronic Eustachian tube dilatory dysfunction.


### CODES

<table>
<thead>
<tr>
<th>Codes</th>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPT</td>
<td>69799</td>
<td>Unlisted procedure, middle ear</td>
</tr>
<tr>
<td>HCPCS</td>
<td>C9745</td>
<td>Nasal endoscopy, surgical; balloon dilation of eustachian tube</td>
</tr>
</tbody>
</table>

*Date of Origin: June 2017*