Standardizing Outcomes in Endoscopic Ear Surgery

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What outcomes matter in otology?

- Hearing
- Perforation closure
- Cholesteatoma recidivism
- Canal-wall down rate
- Transcanal surgery rate
- Pain
- OR time
How do we believe the endoscope will help?

- Hearing?
- Perforation closure?
- Cholesteatoma recidivism?
- Canal-wall down rate?
- Transcanal surgery rate?
- Pain?
- OR time?
The Endoscope Mantra...

- See more...
The Endoscope Mantra...

• See more...
• Do more...
The Endoscope Mantra...

• See more...
• Do more...
• With less.
Quantifying the Mantra
How do we **believe** the endoscope will help?

- Hearing results, Perforation closure, OR time
- Cholesteatoma residual rate, Canal wall down
- Mastoidectomy Rate, Transcanal Surgery, Pain
How do we quantify whether the endoscope helps?

- Hearing results, Perforation closure, OR time
- Cholesteatoma residual rate, Canal wall down
- Mastoidectomy Rate, Transcanal Surgery, Pain
# EES Classification System

<table>
<thead>
<tr>
<th>EES Class</th>
<th>Class 0</th>
<th>Class 1</th>
<th>Class 2a</th>
<th>Class 2b</th>
<th>Class 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extent of endoscope use</td>
<td>Binocular microscope only</td>
<td>Inspection only (Endoscope used to assess for disease)</td>
<td>Mixed Dissection (Endoscope used &lt; 50% of dissection)</td>
<td>Mixed Dissection (Endoscope used &gt; 50% of dissection)</td>
<td>Endoscopy only (Microscope not used)</td>
</tr>
</tbody>
</table>

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Cohen et al, Laryngoscope 2017
Development and Validation of an Endoscopic Ear Surgery Classification System

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Validating the Classification System

IRB approval

50 operative reports were randomly selected

- Included adult and pediatric populations

Reports were de-identified and incorporated into a survey format

Survey emailed to raters

Cohen et al, Laryngoscope 2017
Validating the Classification System

- Each operative report was rated by:
  - The two institutional surgeons (IS1 and IS2)
  - External surgeon (ES)
  - Otolaryngology resident (R)
  - Medical student (MS)
Statistical analysis

- Sample size calculated with equal proportion
- Weighted kappa was used to measure inter-rater agreements
- Landis and Koch classification\(^1\);
  - *Slight* (≤0.20)
  - *Fair* (0.21–0.40)
  - *Moderate* (0.41–0.60)
  - *Substantial* (0.61–0.80)
  - *Almost perfect* (0.81–1.00)

\(^1\) Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics*. 1977;159-74
Inter-rater agreement for Classification:

<table>
<thead>
<tr>
<th>Rater’s Kappa</th>
<th>IS1 Kw (95%BC CI)*</th>
<th>IS2 Kw (95%BC CI)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>IS2</td>
<td>0.79 (0.58-0.93)</td>
<td>-</td>
</tr>
<tr>
<td>ES</td>
<td>0.77 (0.58-0.89)</td>
<td>0.76 (0.57-0.88)</td>
</tr>
<tr>
<td>R</td>
<td>0.73 (0.53-0.88)</td>
<td>0.62 (0.38-0.80)</td>
</tr>
<tr>
<td>MS</td>
<td>0.75 (0.56-0.89)</td>
<td>0.70 (0.49-0.85)</td>
</tr>
</tbody>
</table>

IS1 = Institutional surgeon 1, IS 2 = Institutional surgeon 2, ES = External surgeon, R = Resident, MS = Medical student, *K = unweighted kappa, Kw = Weighted Kappa BC = Bias corrected, CI = Confidence intervals (calculated using 1000 bootstrap replicates).
Retrospective application of classification
Pediatric Tympanoplasty

• Type-1 tympanoplasty without cholesteatoma
• No difference in closure rates with endoscope vs microscope (TEES = 86.7% vs non-TEES 72.2 %, p=0.41)
• No difference in mean PTA outcomes (TEES -8.5 dB, vs non-TEES -2.5 dB, p=0.05)
• No difference in total OR time (time in room) or procedure time

Cohen et. al. Laryngoscope 2015
Pediatric Ossiculoplasty

- Comparative cohort study at two tertiary care centers.
- Retrospective review of 200 pediatric ossiculoplasty cases from February 2009 to March 2018.
Pediatric Ossiculoplasty

- no significant difference in ΔPTA after microscopic cases compared to endoscopic cases (-12.5 dB versus -10.5 dB, p=0.40)
- Microscopic ossiculoplasty was significantly more likely to use a postauricular approach versus a transcanal approach (p=0.0001).
- No significant difference in complications (microscopic = 8, endoscopic = 2)
## Cholesteatoma Outcomes

<table>
<thead>
<tr>
<th>Study</th>
<th>N</th>
<th>2nd look residual rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yung et al, 2001</td>
<td>231</td>
<td>8.2%</td>
</tr>
<tr>
<td>Tarabichi et al, 2004</td>
<td>73</td>
<td>N=6</td>
</tr>
<tr>
<td>Barakate et al, 2008</td>
<td>68</td>
<td>20.6%</td>
</tr>
<tr>
<td>Marchioni et al, 2015</td>
<td>31</td>
<td>32.2%</td>
</tr>
<tr>
<td>Cohen et al, 2015</td>
<td>55</td>
<td>36%</td>
</tr>
<tr>
<td>Hunter et al, 2016</td>
<td>15 e, 10 m</td>
<td>20% endo, 40% micro</td>
</tr>
<tr>
<td>James et al, 2016</td>
<td>19 e, 26 m</td>
<td>15% endo, 24% micro</td>
</tr>
<tr>
<td>Cohen et al, 2017</td>
<td>39 e, 25 m</td>
<td>23% endo, 24% micro</td>
</tr>
</tbody>
</table>
Residual disease rates during second look

Cohen et al, Laryngoscope 2017
Transcanal rates over time

Cohen et. al, Laryngoscope 2017

p = 0.0001
Mastoidectomy rates over time

![Chart showing mastoidectomy rates over time with significant decrease from 2011-2013 (P = 0.04) to 2014-2015.](image)

Cohen et. al, Laryngoscope 2017
Pediatric Cholesteatoma Systematic Review

- 8 studies
- 453 pediatric cholesteatoma cases (260 EES, 193 microscopic)
- RR for residual disease is 0.56 for EES vs microscopic (95% CI 0.4-0.8, p = 0.001)
Prospective Studies
Patient Reported Pain following Ear Surgery

• Surveys administered to caregivers of pediatric ear surgery patients
• Pain intensity and medication use was recorded twice daily for 6 days, beginning on postoperative day 0
• Electronic Survey Tool
• TEES (class 3) compared to all other EES classes (classes 0-2b)
Patient Reported Pain following Ear Surgery

Evetter Ronner, BA
Patient Reported Pain following Ear Surgery

Average reported postoperative pain

![Graph showing average pain levels over days since surgery]

Evetter Ronner, BA
Patient Reported Pain following Ear Surgery

Evetter Ronner, BA
Ear Surgery Outcomes

Age: {Numbers; 0-100; 15068} {TIME; UNIT MONTH TO YEAR:30818} old

Sex: {Desc; male/female: 11659}

Past ipsilateral Otologic Surgery: {Past Ipsilateral Otologic Surgery: 30820}

Date of prior ipsilateral surgery (MM/DD/YYYY): ***

Past Contralateral Otologic Surgery: {Past Contralateral Otologic Surgery: 29972}

Date of prior contralateral Otologic Surgery (MM/DD/YYYY): ***

Presents for: {Tympanic Membr Perf, Tymp Memb Retr, Susp for Chol, etc.: 29973}

Laterality: {Right Left: 30014}

Procedure: {Tympanoplasty, Middle Ear Exploration, Ossiculoplasty, etc.: 29977}

Approach to Surgery: {Approach to Surgery: 29981}

Use of Endoscope: {Use of Endoscope: 29982}

Surgical Details: {Tympanoplasty, Ossiculoplasty, Stapedectomy and Cholesteatoma: 29985}
International Collaborative Assessment of the Validity of the EAONO-JOS Cholesteatoma Staging System

*Adrian L. James, ‡Tetsuya Tono, §Michael S. Cohen, §Arunachalam Iyer, ||Lynn Cooke
¶Yuka Morita, †Keiji Matsuda, **Yutaka Yamamoto, ††Masafumi Sakagami, and #Matthew Yung
Cholesteatoma Staging

- 1977 Fisch
- 1984 Lien
- 1986 Meyerhoff
- 1989 Tos and Lau
- 1991 Bartels
- 1993 Sanna et al.
- 1999 Saleh and Mills
- 2000 Tos (Cholesteatoma meeting)
- 2002 Potsic and Wetmore
- 2008 Japanese Otological Society
- 2008 Moffat et al.
- 2009 Telmesani et al.
- 2012 Belal et al.
- 2015 Presutti, Marchioni
- 2015 Olszewksa et al. (EAONO)
- 2017 EAONO/JOS
- 2018 Linder et al.
EAONO-JOS Stage: Should we use it?

Advantages

- Years of development
- International consensus
- Relevant data-fields

- Allows international collaboration
- Better than independent datasets

- Can be improved with evidence based data
Thank you!

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