INTRODUCTION

Ferromagnetic stapes prostheses used can interact with the magnetic resonance imaging (MRI) possibly resulting in piston motion and heating that, in turn, can even result in hearing loss or other ear damage. Stapes prostheses composed of nonmagnetic metals and alloys such as titanium, platinum, and tantalum do not interact with magnetic resonance fields.

The NYEEI piston (see Fig. 1) and Armstrong piston (see Fig. 2) are completely nonferromagnetic. The hook in both pistons is composed of platinum whereas the stem is composed of titanium in the NYEEI piston and of Plastipore® in the Armstrong piston. The purpose of this investigation was to examine the short-term hearing efficacy of the NYEEI versus Armstrong prosthesis at 6 weeks postoperatively.

METHODS AND MATERIALS

The study design is a retrospective review of records of primary stapedotomy procedures performed using the Armstrong or NYEEI piston between 2007 and 2010 by the senior author. Records were excluded if (a) the operative diagnosis was obliterated otosclerosis or congenital fixation, (b) the argon laser was not employed, or (c) patients footplate drill-out occurred.

The mean pre- and postoperatively conducted (AC) thresholds; bone-conduction (BC) thresholds; and air-bone gaps (ABGs) were calculated using 500, 1000, 2000, and 3000 Hz (1995 AAO-HNS guidelines). The improvement in ABG (preoperative PTA ABG minus postoperative PTA ABG) and hearing gain preoperative PTA AC minus postoperative PTA AC were calculated.

RESULTS (Continued)

Fig. 3 shows the box-and-whisker plots for the preoperative AC thresholds at each pure-tone frequency and for the PTA for the NYEEI (top) and Armstrong (bottom) groups. The results of the two-sample Wilcoxon rank-sum test revealed no significant difference (P > 0.05) between groups in median age or median preoperative word-recognition score.

The median PTA hearing gain (improvement in AC thresholds with surgery) was 28 dB for both prostheses (95% CI = 4.42 dB for the NYEEI piston and was 15.48 dB for the Armstrong prosthesis). The results of the 2-sample Wilcoxon rank-sum test revealed no significant difference between groups in the median PTA hearing gain (P = 0.2766).

RESULTS (Continued)

Table 1 shows the median (and 95% CI) preoperative and postoperative PTA ABG in dB for both piston groups. The ABG improvement with surgery was 20 dB and 21 dB for the NYEEI and Armstrong groups, respectively. The results of the 2-sample Wilcoxon rank-sum test on the ABG improvement revealed no significant difference between groups (P = 0.8423).

Table 2 shows the percentage of ears in which closure of the PTA ABG was achieved within 10 dB and within 11-20 dB. As can be seen from the table, the results are similar for the two piston groups and the majority of ears in both groups had closure within 10 dB.

Table 1. Pre- and post-op median (and 95% CI) PTA ABG for both piston groups.

<table>
<thead>
<tr>
<th>Piston Group</th>
<th>Median Preop PTA ABG in dB (and 95% CI)</th>
<th>Median Postop PTA ABG in dB (and 95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NYEEI (n = 17)</td>
<td>29 (8,41)</td>
<td>9 (0,18)</td>
</tr>
<tr>
<td>Armstrong (n = 14)</td>
<td>29.5 (18,50)</td>
<td>8.5 (1,16)</td>
</tr>
</tbody>
</table>

Table 2. % with PTA ABG closure within 10 dB and within 11-20 dB in each of the piston groups.

<table>
<thead>
<tr>
<th>Piston Group</th>
<th>% with PTA ABG closure w/in 10 dB</th>
<th>% with PTA ABG closure w/in 11-20 dB</th>
</tr>
</thead>
<tbody>
<tr>
<td>NYEEI</td>
<td>59</td>
<td>41</td>
</tr>
<tr>
<td>Armstrong</td>
<td>64</td>
<td>36</td>
</tr>
</tbody>
</table>

DISCUSSION

The findings reveal no significant differences between these nonferromagnetic prostheses in short-term efficacy with respect to median PTA hearing gain, improvement in PTA ABG; and both groups demonstrated similar PTA ABG closures. The narrower diameter of the NYEEI prosthesis makes it easier to insert than wider diameter prostheses in ears with a narrow oval window niche. Future research is needed to examine long-term efficacy of the NYEEI vs. Armstrong and other nonferromagnetic prostheses.

CONCLUSIONS

The NYEEI 0.5 mm diameter piston is essentially similar to the Armstrong style stapes piston, and in short-term hearing outcome. Future long-term efficacy research is needed.

REFERENCES


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