Evaluation of a new coupler for the floating mass transducer
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The purpose of this study is to evaluate the acoustic performance of a new modified FMT designed to optimally contact the RW membrane.

ABSTRACT
Optimal placement is an important factor in the acoustic performance of the Vibrant Soundbridge Floating Mass Transducer® (FMT) in the round window niche (RW). The purpose of this study is to evaluate the acoustic performance of a new modified FMT without fascia.

INTRODUCTION
A new modified FMT (VIBRANT MED-EL, Soundbridge) without fascia was placed on the RW membrane (Fig. 4), and the displacement of the TW in response to an FMT input of 316 mV over the same frequency range was measured.

METHODS AND MATERIALS
The basal turn of the cochlea was skeletonized using a diamond burr and the bony wall of the scala tympani removed creating a “Third Window” (TW) into the cochlea in six intact human temporal bones. Care was taken to leave the endosteum intact with no loss of cochlear fluid. The velocity of the TW was first measured in response to a constant sound pressure input at the tympanic membrane using a laser Doppler vibrometer (HLV-1000; Polytec). Measurements were taken using the SYSid 6.5 audio band measurement and analysis system (Fig. 3).

RESULTS
The individual amplitude of TW displacement of the new modified FMT without fascia, normalized to the TW displacement in the intact ossicular chain at 80 dB SPL input.

CONCLUSIONS
In this temporal bone model, the modified FMT placed on the RW provided similar and reasonable performance both with and without fascia in the RW niche. It appears superior to a conventional FMT used in the RW and is easier to insert.

REFERENCES

CONCLUSIONS
There was no statistical significance in the acoustic performance between the FMT placed on the RW with fascia and without fascia at several frequencies between 0.5 and 8.0 kHz.

DISCUSSION
The FMT in the RW has been reported to be an effective method for treating hearing loss (1). Shimizu et al. tested the conventional FMT without the coupler and found that the mean TW response of a FMT placed on the RW provided a 10-30 dB SPL input at the tympanic membrane equivalent to a 100-108 dB SPL input at the tympanic membrane (2). It does appear that the new FMT with fascia is better than the old by about 10 dB at most frequencies, although not statistically significant.

Figure 8. The individual amplitude of TW displacement of the new modified FMT with fascia, normalized to the TW displacement in the intact ossicular chain at 80 dB SPL input.

Table 1. The mean amplitude (relative dB SPL)

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<tr>
<th>Frequency (kHz)</th>
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<th>FMT without fascia</th>
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<tr>
<td>0.5</td>
<td>75.3</td>
<td>105.5</td>
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<td>1</td>
<td>117.6</td>
<td>119.1</td>
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CONCLUSIONS
The authors wish to thank Geoffrey Hall and MED-EL for support of this study.

Figure 6. The individual amplitude of TW displacement in the intact ossicular chain at 80 dB SPL input of a human fresh temporal bone.

Figure 5. Photograph of the new modified FMT without fascia.

Figure 3. Measurement system.

Figure 2. A new modified FMT is inserted into a RW.

Figure 1. A new modified FMT (VIBRANT MED-EL, Soundbridge) without fascia was placed on the RW membrane (Fig. 4), and the displacement of the TW in response to an FMT input of 316 mV over the same frequency range was measured.

Figure 8. The individual amplitude of TW displacement of the new modified FMT with fascia, normalized to the TW displacement in the intact ossicular chain at 80 dB SPL input.

Figure 7. The individual amplitude of TW displacement of the new modified FMT without fascia, normalized to the TW displacement in the intact ossicular chain at 80 dB SPL input.

Figure 4. Photograph of the new modified FMT without fascia.

Figure 9. The individual amplitude of TW displacement of the new modified FMT with fascia, normalized to the TW displacement in the intact ossicular chain at 80 dB SPL input.

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