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#### **A new diagnostic apparatus for ossicular fixation: Evaluation of the usability through the measurements in human temporal bones and patients**

*T. Koike<sup>1</sup>, S. Hamanishi<sup>2</sup>, Y. Yuasa<sup>3</sup>, R. Yuasa<sup>3</sup>, T. Kobayashi<sup>4</sup>, HH. Nakajima<sup>5</sup>, W. Chien<sup>5</sup>, M. Ravicz<sup>5</sup>, SN. Merchant<sup>5</sup>, JJ. Rosowski<sup>5</sup>, RL. Goode<sup>6</sup>, H. Wada<sup>2</sup>, Tokyo<sup>1</sup>, Sendai<sup>2,3,4</sup>; Japan, Boston<sup>5</sup>, Stanford<sup>6</sup>; USA*

The evaluation of ossicular mobility is an important parameter in decisions regarding surgical repairs of diseased ears as well as for post-surgical improvement in hearing level. To evaluate ossicular mobility in surgery, we have developed an apparatus that quasi-statically measures the load and displacement of the ossicles, where the compliance defined by the slope of the load-displacement curve has been used as an index of ossicular mobility. In a pilot study, this apparatus was used to measure the ossicular mobility in human temporal bones at the stapes and the malleus body before and after the ossicles were artificially fixed. These results were compared with simultaneous estimates of ossicular mobility obtained with a laser Doppler velocimeter (LDV). A correlation was seen between the ossicular mobility measured with our apparatus and the vibration amplitude of the ossicles. In addition, the ossicular mobility of three patients with otosclerosis or chronic otitis media was also measured to evaluate the usability of the apparatus. The apparatus can distinguish the differences in ossicular mobility between normal and fixed ossicles, and it makes estimating the change of mobility between pre- and post-treatments for ossicular fixation possible. Positive correlation was seen between ossicular mobility and hearing level. These results suggest that our apparatus has the ability to detect the difference in ossicular mobility quantitatively between fixed and normal ears, and gives support to the idea that our apparatus could be a useful tool in the surgical estimate of ossicular disorders.