Sentac Abstract

250 words with no mention of the hospital or names of investigators, title: 120 characters

**Design of Controllable Flexible Instruments to Facilitate Endoscopic Ear Surgery**

**Background:** Transcanal endoscopic ear surgery (TEES) has undergone a surge of enthusiasm over the last 5-10 years due to the benefits of minimally invasive surgery and clear, direct access to the tympanic membrane and recesses of the tympanic cavity. Compared to the microscope, the endoscope is able to visualize cholesteatoma within the hidden recesses of the middle ear and the time to complete TEES tympanoplasty is reduced. However, due to the one-handed surgical technique required for TEES, the surgery is challenging and the learning curve is steep. Existing instruments have not been designed to accommodate this challenge. **Objective:** To design instruments to facilitate the challenges experienced during TEES. **Methods:** A needs analysis questionnaire was sent to otologists internationally to determine the degree of need for instrumentation to address difficulties experienced during TEES. As well, a time flow study recorded the duration of surgical steps during TEES to identify the inefficiencies during surgery and which tool functionalities would facilitate these steps. **Results:** We received responses from 22 endoscopic ear surgeons.The surgical difficulty of “reaching structures visualized by the endoscope” scored an average of 83% ± 4% need for new instrumentation. ANOVA with a 95% confidence interval showed that there was no significant effect of TEES experience on the difficulty experienced. Raising the tympanomeatal flap during TEES tympanoplasty takes the longest time during surgery with a median of 23.5 minutes, out of 9 surgeries. **Conclusion:** Here, we present a tool that can reach into the antrum and mastoid through an atticoantrostomy. The curvature of the tool tip was designed using patient CT scans with anatomy that were at the limits of what TEES can do. The tool can reach these areas in a 3D printed temporal bone model, addressing the need of reaching structures visualized by the endoscope.

References:

Studies have shown the time to complete TEES tympanoplasty is reduced compared to microscopic (Kuo & Wu, 2017).