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**

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. Studies have shown that 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 instrumentation has not been designed for the one-handed surgical technique; this project aims to design instruments that would facilitate TEES. A needs analysis questionnaire was sent to otologists 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. Reaching structures visualized by the endoscope was identified as a surgical difficulty that scored 83% ± 4% need of new instrumentation. Raising the tympanomeatal flap during TEES tympanoplasty takes the longest time during surgery with a median of 23.5 minutes, out of 9 surgeries. Here, we present a tool that can reach into the antrum and mastoid through an atticoantrostomy. The tool is shown reaching into these areas in a 3D printed temporal bone model. Patient CT scans with anatomy that were the limits of what TEES can do were converted into 3D models and used to determine the optimal curvature of tools required to reach target points.

Notes:

* Time flow study data is only for tympanoplasty so far, and the data indicates that raising the flap takes the longest time. A tool for raising the flap might not be a bendable tool
* The needs survey (with 19 responses) indicates that a tool that can reach structures visualized by the endoscope is most required so that would be a rational for prototyping and presenting a tool that has controllable bending

References:

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