**OBJECTIVES**

- Identify the effect of middle ear disease-induced structure and mechanical property disorders on sound transmission in the ear.
- Characterize the mechanical properties of ear tissues such as the tympanic membrane (TM) or eardrum, incus-stapes joint, round window membrane, and stapedial annular ligament.
- Improve the current finite element (FE) model of the human ear by introducing viscoelastic and dynamic properties of ear tissues in the model and by modeling the ultrastructure of ear tissues.
- Generate FE model-derived middle ear function curves such as the FE-tympanogram, FE-ER (energy reflectance), FE-MTF (middle ear transfer function), and FE-Holography, in ears with middle ear disorders for potential clinical applications.

**BACKGROUND**

- Middle ear diseases such as otitis media, TM perforation, and ossicular dysfunction have been created in animal and human cadaver ears for measuring sound transmission through the ear.
- Quasi-static and dynamic properties of ear tissues such the TM and middle ear ligaments have been measured with different techniques.
- 3D FE model of the human ear with anatomic structures and advanced function analysis capabilities are developed.

**CLINICAL APPLICATION**

A wideband tympanogram measured from a healthy male ear.

**REFERENCES**