Anatomical and Feasibility Pilot Study of Selective Trans-nasal Injection of the Tensor Tympani Muscle

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INTRODUCTION

- The tensor tympani muscle tensions the tympanic membrane and the middle ear bones[1]
- Muscle dysfunction leads to increased contraction, causing Myoclonus Tensor Tympani Syndrome[2]
- Syndrome leads to tinnitus, vertigo, and sensation of fullness in ear[3]
- A case report showed potential of applying Botox in the vicinity of the muscle, but highlighted the need for direct muscle belly injection[4]

AIMS

- Perform an anatomical literature review of the tensor tympani muscle
- Evaluate the feasibility of a transnasal access to the tensor tympani muscle via cadaver head

ANATOMICAL REVIEW

- Tensor tympani originates from the eustachian tube cartilage and traverses the semicanal[5]
- The isthmus is the narrowest part of the eustachian tube that prevents progression to the osseous portion of the eustachian tube[6]
- Best transnasal approach is through the cartilaginous Eustachian tube to the level of the isthmus

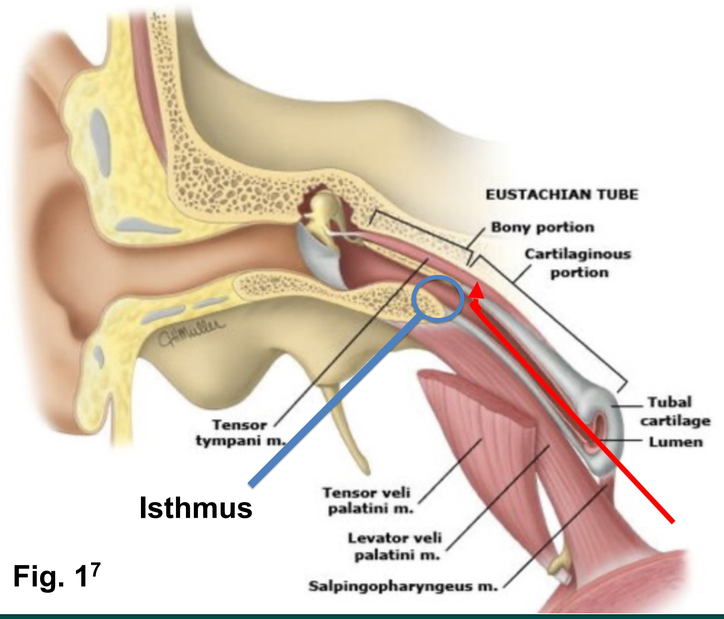

Fig. 1[7]

METHODS

Pilot study for optimal volume of injection

- Radio-opaque iohexol with food coloring were prepared in varying volumes
- Increasing volumes of mixture were injected into cadaveric intranasal turbinates
- CT scan of cadaver heads was completed to evaluate diffusion and visualization of mixture

Evaluation of feasibility of passing scope through eustachian tube and performing injection

- 1 mL syringe with contrast dye connected to 26-gauge microtubing
- Tubing passed through channel of Storz Flexible Cystoscope **(Fig. 2)** with side channel
- 26.5-guage needle affixed to end of tubing to complete injection setup
- Scope was navigated transnasally to the eustachian tube and advanced to the isthmus
- Needle inserted into eustachian tube sidewall and injection completed
- CT completed of cadaveric head and reviewed for opaque injection location

Fig. 2 Storz Flexible Cystoscope

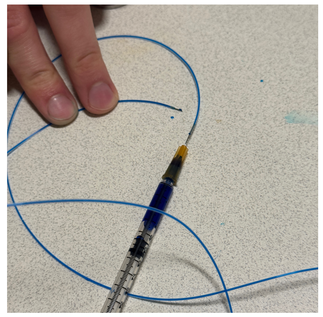

Fig. 3 Injection setup with a 1 mL syringe connected to 26-gauge microtubing pre-filled with dyed contrast, with an affixed 26.5-gauge needle at the end

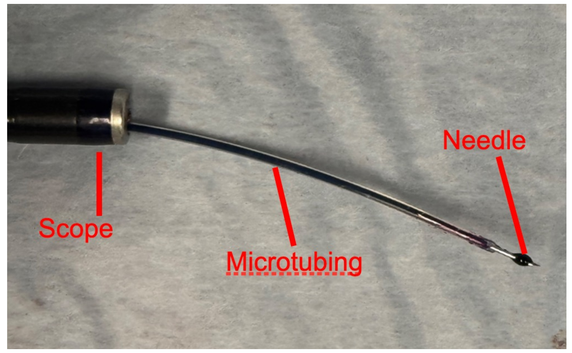

Fig. 4 Injection setup inserted into the scope channel, with the pre-filled microtubing and 26.5-gauge needle positioned for tensor tympani injection

RESULTS

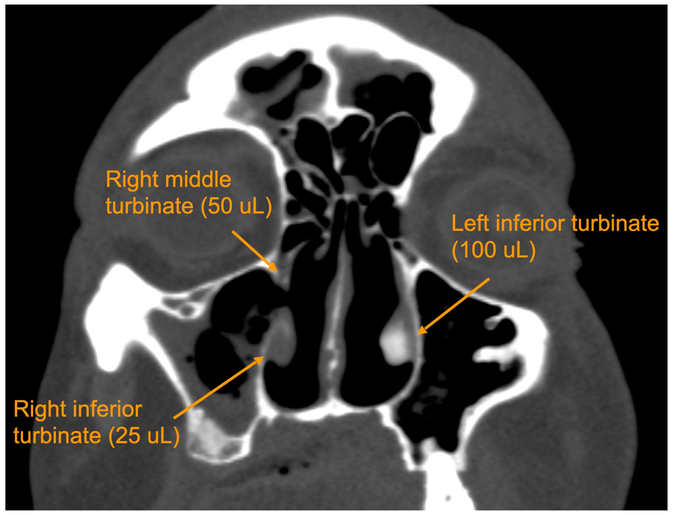

Fig. 5 Coronal head CT bone window demonstrating volume-dependent injection contrast in the middle and inferior turbinates

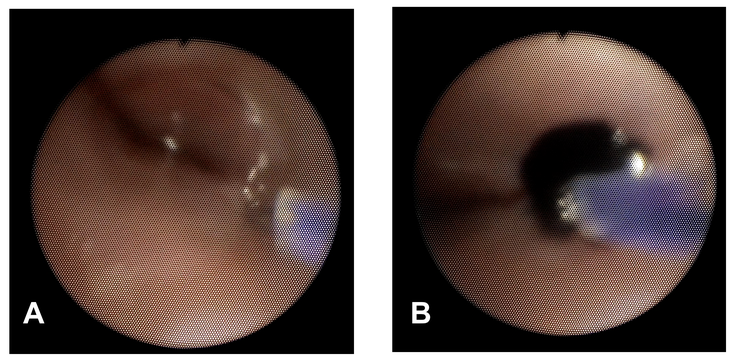

Fig. 6 Endoscopic view of the eustachian tube with needle insertion (A). Injection of dyed contrast (B).

CONCLUSION & NEXT STEPS

- 100 µL injection is optimal for CT scan visualization and limited diffusion
- Feasible to insert a needle in the Eustachian tube and perform an injection via a channeled scope
- Conduct further imaging to determine if the tensor tympani muscle was targeted
- Apply for grants for funding of future cadaver head labs and CT scans
- Expand the study to include multiple cadaver heads to validate reproducibility
- Expand to a clinical study

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