

# Transnasal Endoscopic Model

Justin Lundell, Mike Socie, Alice Tang, Karissa Thoma  
Client: Brian Petty, M.A., CCC-SLP

Advisor: Professor Willis Tompkins, Department of Biomedical Engineering, University of Wisconsin – Madison

## Abstract

To train clinicians to perform transnasal endoscopy of the larynx, a model with realistic and anatomically correct structures of the nasal passages and larynx must be developed. Currently, training is conducted on human volunteers and/or patients. The current prototype incorporates a feedback system to increase the competency of clinicians. Future work involves completion of user feedback system and clinical testing.

## Background

- Transnasal endoscopy
  - Procedure to view vocal structures
  - Uses flexible endoscope



Fig. 1 Flexible Endoscope [1]



Fig. 2 Endoscopic view of vocal cords and throat structures [2]

- Motivation
  - Train on volunteers
  - Touching sensitive regions causes discomfort
- Existing models
  - Constructed of hard plastic
  - Only tactile feedback

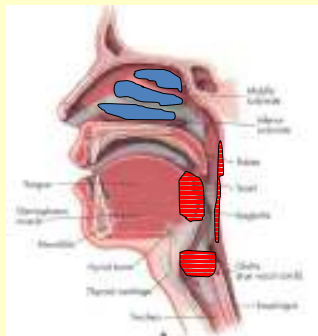


Fig. 3 Anatomy of nasal passage and larynx [3]

## Design Specifications

- Accurately model nasal passages and larynx
- Provide user feedback when mistakes occur
- Materials mimic natural tissue structures
- Should cost less than \$3000

## Current Prototype

Prototype cost: \$125



Fig. 4 Model cutaway showing foam cross-section assembly



Fig. 5 Inferior turbinate in nasal passage of model



Fig. 6 Throat structures and larynx

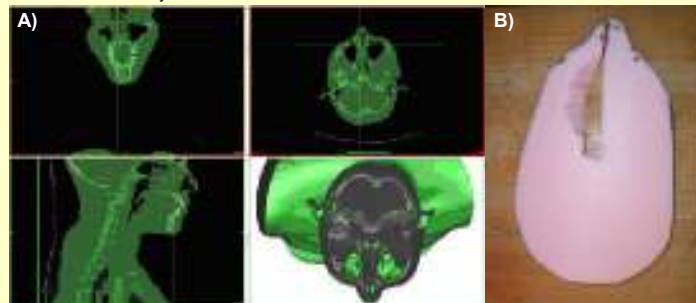


Fig. 7 (A) Computer model of head and throat created from Computed Tomography data. (B) Corresponding foam cross-section from (A).

## Testing and Results

- Verified ability to detect pressure changes on turbinates
- Client evaluated prototype for future improvements
  - Aesthetics
  - Improve switch sensitivity



Fig. 8 Endoscope entry through nostril

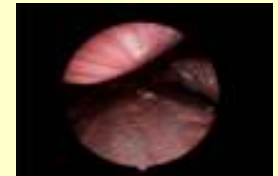


Fig. 9 Scope view between turbinates and hard palate



Fig. 10 Scope view of larynx



Fig. 11 Scope View of vocal cords

## Future Work

- Implement client feedback from testing
- Obtain USB pressure sensor
- Program LabView for user feedback
- Clinically test model
  - Set limits for turbinate pressures

## References

1. Olympus Corporation. 2008. <http://www.olympus-global.com/en/corc/history/chron/n260.cfm>
2. University of Delaware. 2008. <http://www.udel.edu/PR/UDaily/2008/jul/vocal073107.html>
3. University of California, San Francisco. 2008. [http://sleepsurgery.ucsf.edu/body.asp?bodyid=sleep\\_palatesurgery](http://sleepsurgery.ucsf.edu/body.asp?bodyid=sleep_palatesurgery)

## Acknowledgements

Brian Petty, Prof. Willis Tompkins, JoAnne Robbins, UW Bone and Joint Mechanics Lab