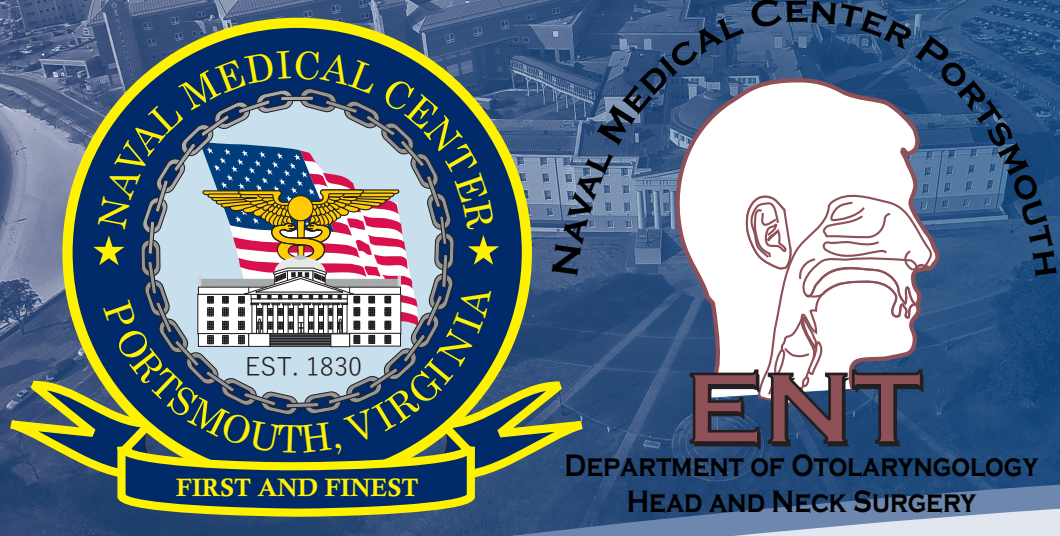


# Eustachian Tube Dysfunction following LeFort I Osteotomy Orthognathic Surgery: A Case Study

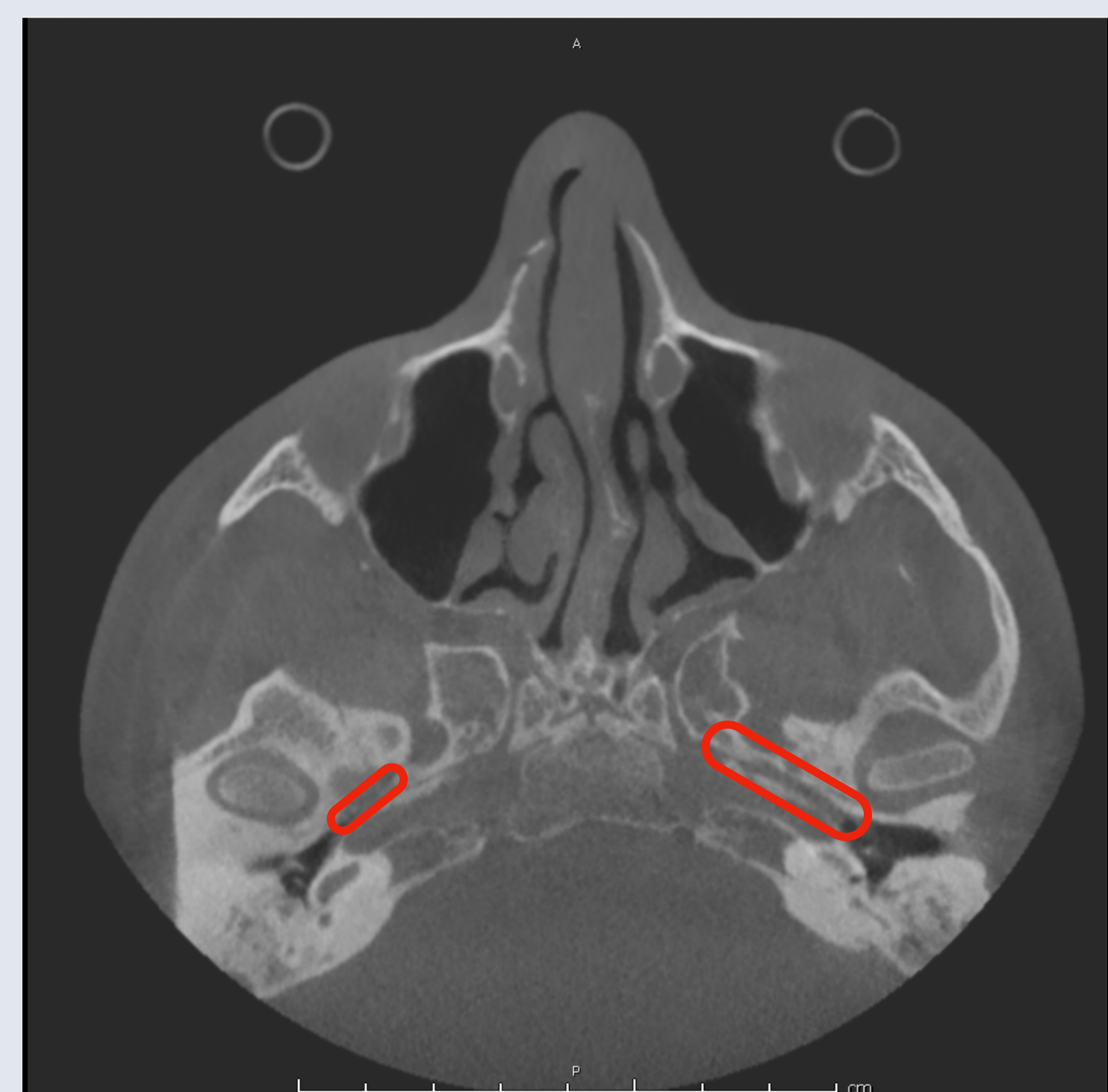
Cameron B. Lindemann DO, LT, MC, USN; Claudia L. Mondragon, MD, LT, MC, USN; Michael J. Eliason, MD, CDR, MC, USN

Department of Otolaryngology  
Naval Medical Center Portsmouth, Virginia



## Introduction

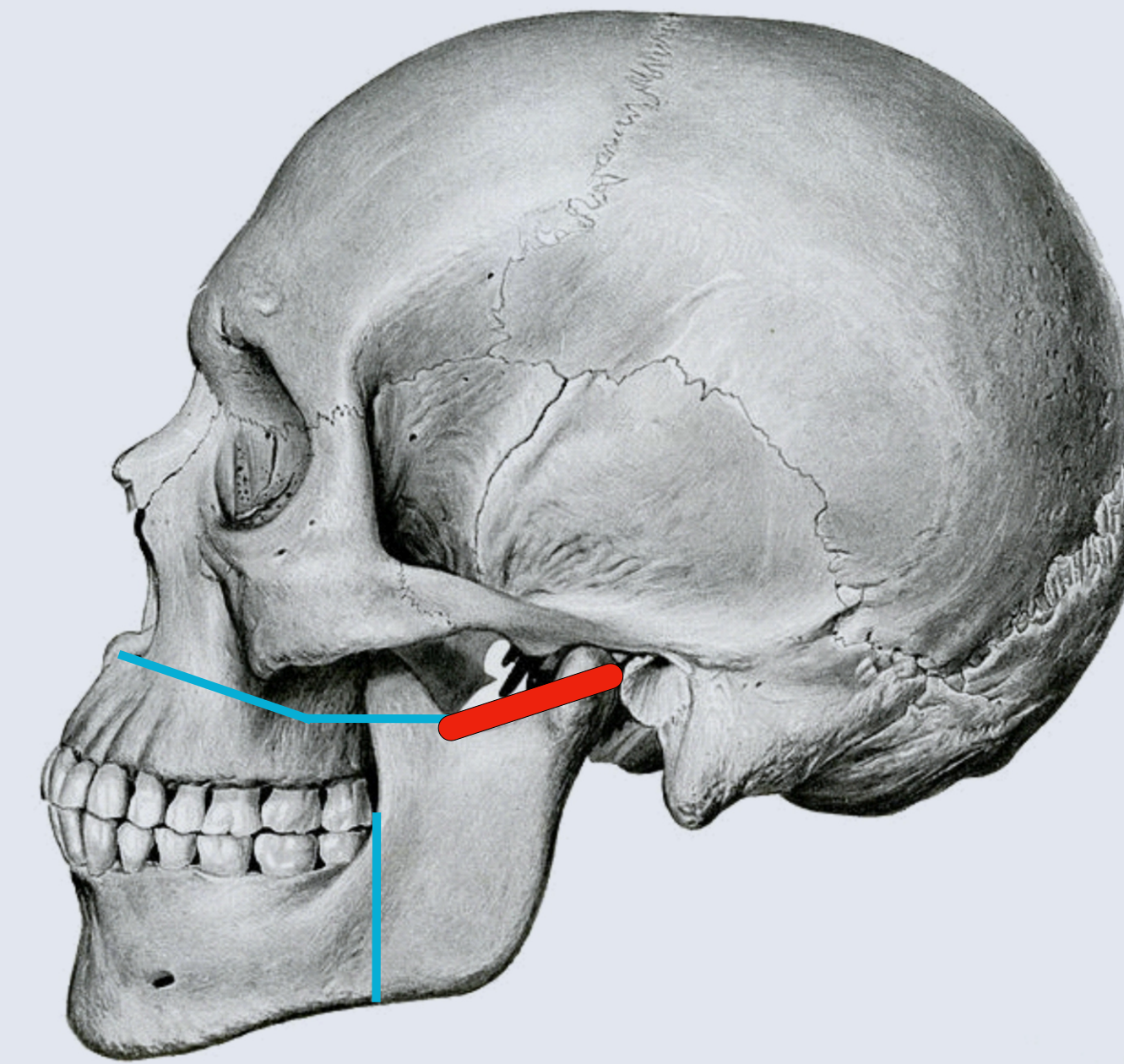
The pharyngotympanic, or eustachian tube is a mucosal lined conduit connecting the mesotympanum with the nasopharynx. It allows for pressure equalization between the middle ear and the ambient environment. Additionally, it allows for drainage of fluid and secretions from the middle ear. These functions are integral to maintaining a healthy middle ear and tympanic membrane. Inadequate function of this tube is termed eustachian tube dysfunction (ETD) and is one of the most common complaints seen in an otolaryngology clinic.



**Figure 1:** Cone beam CT scan from our patient showing the bony eustachian tube (outlined in red). The tube is within the temporal bone posteriorly, and thus fixed posteriorly. It attaches anteriorly to the Maxilla, which is advanced during LeFort surgery. This changes the trajectory of the tube, making it more horizontal.

LeFort I osteotomies are performed surgically with the intent to correct occlusal abnormalities to improve patient's dental occlusion. The osteotomies allow the upper and lower jaws to move independently from one another in order to improve occlusion. The jaw is then internally fixed in place with use of plates and screws to set the new dental occlusion in place<sup>1,2</sup>.

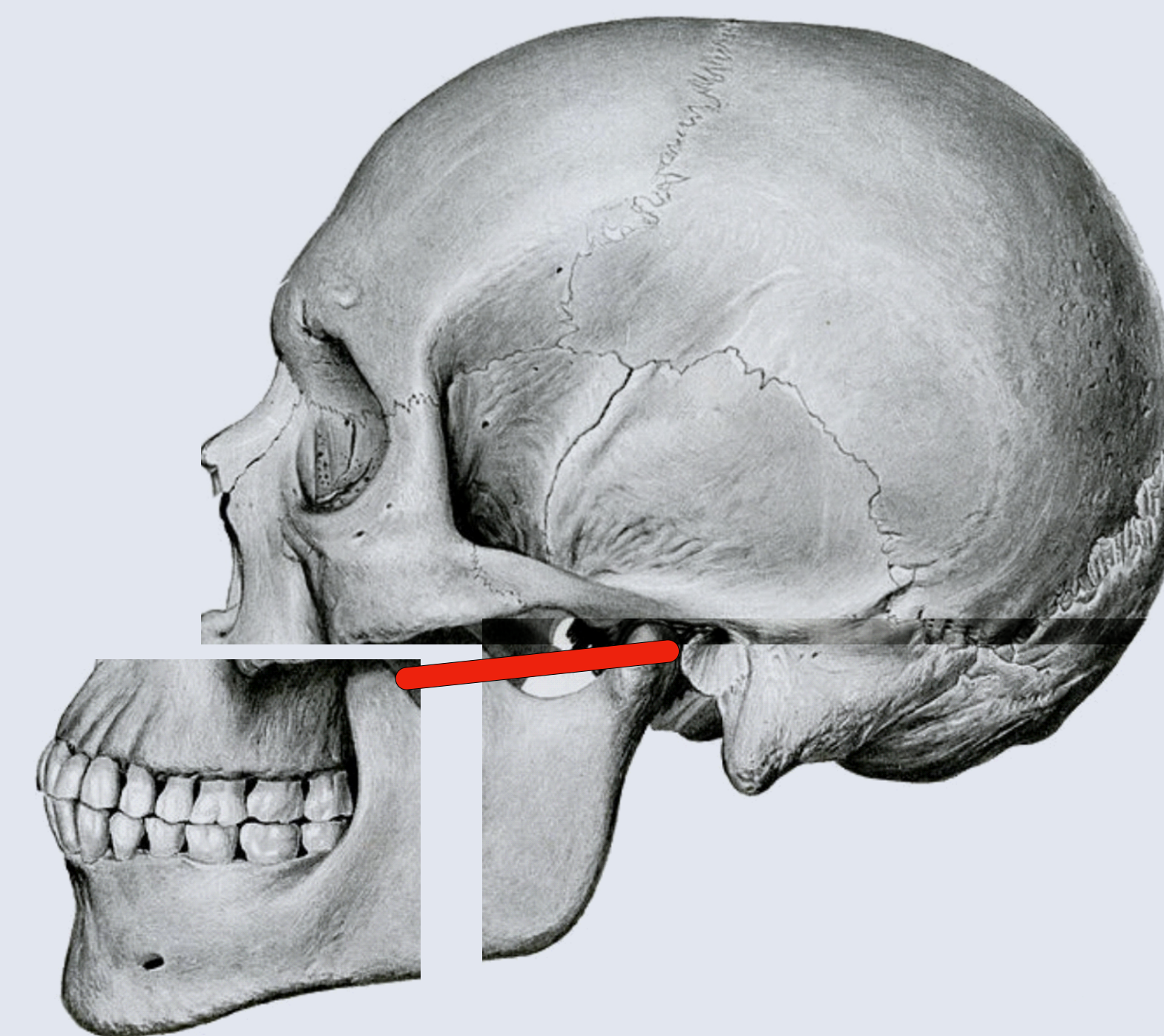
This procedure also impacts several other head and neck anatomic relationships that may alter their function. LeFort I osteotomies have been shown in other studies to cause alterations of sinonasal function<sup>3,4</sup>.



**Figure 2:** Human Skull from a lateral view. Blue lines mark where LeFort I osteotomies are made. The red line approximates the Eustachian Tube.

## Conclusion

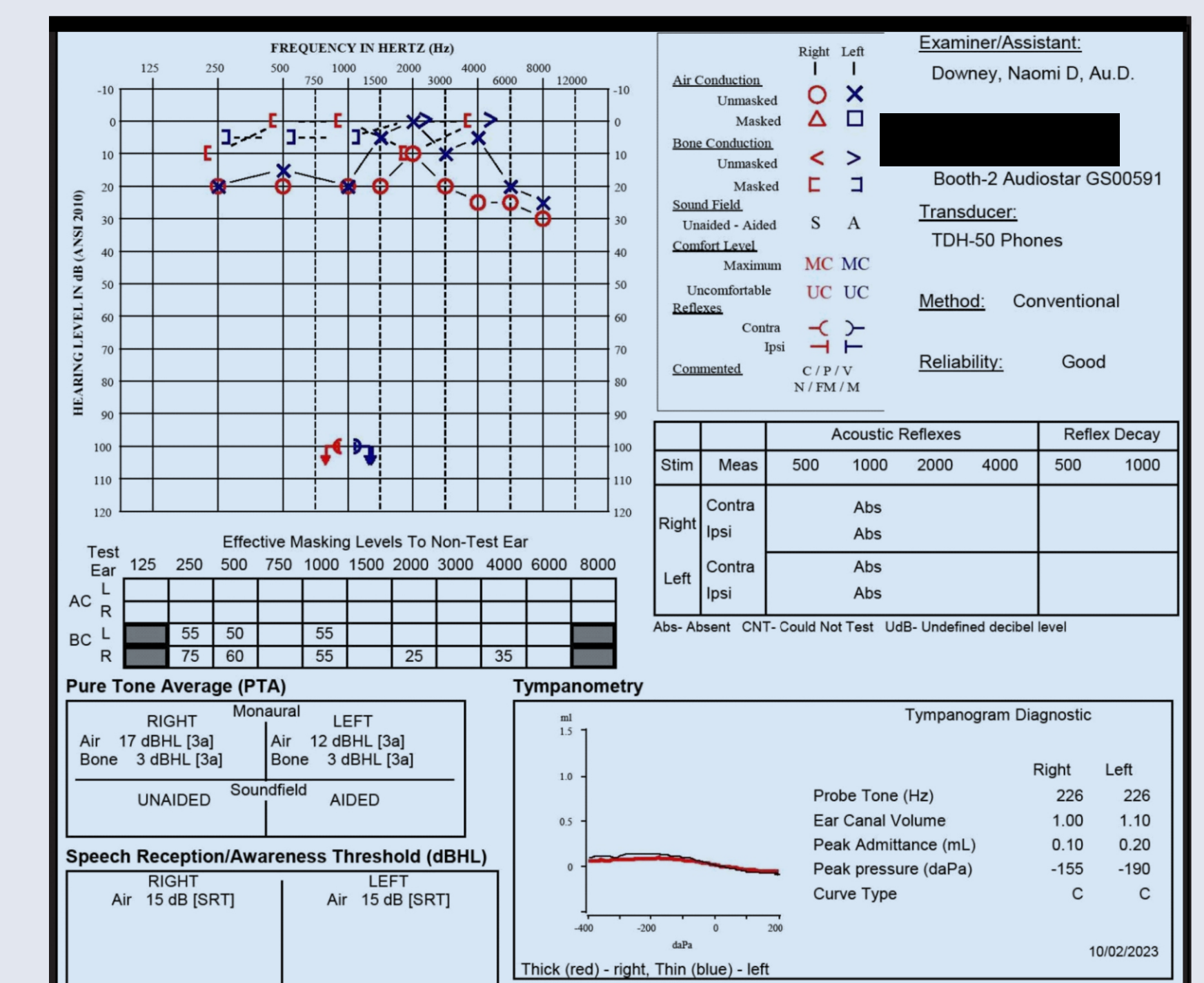
We present the case of 24-year-old male with history of class III occlusal deformity for which he underwent a maxillary advancement with LeFort I osteotomies. Approximately 18-months after his surgery, he presented to the otolaryngology with a clinical picture concerning for eustachian tube dysfunction. Subsequent physical evaluation and formal audiogram confirmed suspected diagnosis. Given the anatomical re-distribution involved with LeFort osteotomies, it is expected to have vector changes in muscles that regulate the function of the eustachian tube, thus we suspect that this surgery may be a major contributing factor of this patient's eustachian tube dysfunction.



**Figure 3:** Human skull post LeFort Osteotomies. The red line approximates the Eustachian tube. Proposed change of tube orientation following LeFort surgery.

## Discussion

LeFort I osteotomies by nature allow mobility of the maxilla and mandibular structures relative to the rest of the viscerocranium. This causes a change in the relationship of the palate and the middle ear, causing the eustachian tube to be more horizontally oriented than it normally is. Additionally, the change in this anatomic relationship changes the muscular orientation of the tensor veli palatini, potentially decreasing its efficacy in opening the eustachian tube. These changes may contribute to eustachian tube dysfunction following LeFort I osteotomies.



**Figure 4:** Post-operative audiogram of our patient showing bilateral conductive hearing loss and type C tympanogram suggesting eustachian tube dysfunction.

## Conclusion

Here we present a case of a 24-year-old male with symptoms and findings of eustachian tube dysfunction also with history of LeFort orthognathic surgery 18 months prior to presentation. Future studies should be carried out to characterize the interaction between LeFort orthognathic surgery and eustachian tube dysfunction.

## References

1. Anatomy and Physiology of the Eustachian Tube. In: Cummings Otolaryngology - Head and Neck Surgery, Vol. 3, 7th ed. Elsevier; 2011.
2. Jędrzejewski M, Smetakala T, Sporniak T, Olszewski R. Preoperative, Intraoperative, and Postoperative Complications in Orthognathic Surgery: A Systematic Review. Clin Oral Invest. 2015;19(5):969-977. doi: 10.1007/s00784-015-1452-1
3. Eliason MJ, Schuler A, Ancher R, Caprio G. The Impact of Maxillary Sagittal Anatomy and Physiology Following LeFort I Osteotomy for Orthognathic Surgery. J Craniofac Surg. 2012;13(1):277-281. doi: 10.1097/FCS.0b013e3182000000000000000000000000
4. Eliason MJ, Caprio G, Lafferty A, Bowers J, Horowitz V, Redding JP. A Pilot Study Assessing the Prevalence of Chronic Otitis Media Following LeFort I Osteotomy in Maxillofacial Surgery. J Craniofac Surg. 2019;30(6):1945-1949. doi: 10.1097/FCS.0000000000000505
5. Klemm E, Sösdögen F, & Mübe B. Arteriovenöse Fistel der A. maxillaris, Tuberkulosis des Vestibulums nach LeFort I Osteotomie. HNO 49, 216-219 (2001). https://doi.org/10.1007/s0010500505236
6. Arnaud-Gleciel, Pierre-Gaspard, Stéphane Tringali, Nicolas Nimeskern, Maxime Fleux, Julie Chauvel-Picard, Disabling hearing loss after LeFort I osteotomies in patients with history of Eustachian tube dysfunction: An unknown complication. Journal of Stomatognathal and Maxillofacial Surgery, Volume 124, Issue 3, 2023, 101395, ISSN 2468-7855. https://doi.org/10.1016/j.joms.2023.101395
7. Ghoshal S, Dasgupta H, Khosravian A, Dasgupta S. The effect of orthognathic surgery on auditory function. Advantages. Plast Reconstr Surg. 2012;130(1):111-117. doi: 10.1097/PRS.0b013e3182000000000000000000000000
8. Thomsen DE, Schneider B, Jensen M, et al. Complications or other side-effects? Quantification of patient satisfaction and complications after orthognathic surgery: a retrospective, cross-sectional long-term analysis. Clin Oral Invest. 2012;16(5):1313-1327. doi: 10.1007/s00784-012-0566-4 (Eustachian tube dysfunction is not reported as a complication of orthognathic surgery)
9. Yaghoobi M, Ghossein A, Sedghi H, et al. Auditory changes in patients undergoing orthognathic surgery. Int J Oral Maxillofac Surg. 2009 Nov;38(11):1148-53. doi: 10.1054/j.ijom.2009.06.002. Epub 2009 Jul 7. PMID: 19586753. Showed no significant change in eustachian tube function following LeFort osteotomies. Did not use ETDT.
10. Park SH, Cho YH, Park H, et al. Subtotal otitis media with effusion caused by reduced middle ear pressure as an unintended otologic complication of orthognathic surgery: case report. Br J Oral Maxillofac Surg. 2014 Sep;57(7):e19-40. doi: 10.1054/bjoms.2014.04.014. Epub 2014 May 21. PMID: 24856547. Cause related in the eustachian tube following LeFort surgery.