3D-Printed Needle Guide for Improved Access to Spasmodic Dysphonia Care at a Remote Military Base

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Key Takeaway:

The advent of relatively cheap and accessible 3D-printing technology can be harnessed to improve access to care for subspecialty-level pathologies.

Figure 1. Virtual model of the larynx and injection guide, based on CT scans. Note the red dots marking the injection sites in the thyroarytenoid muscle.

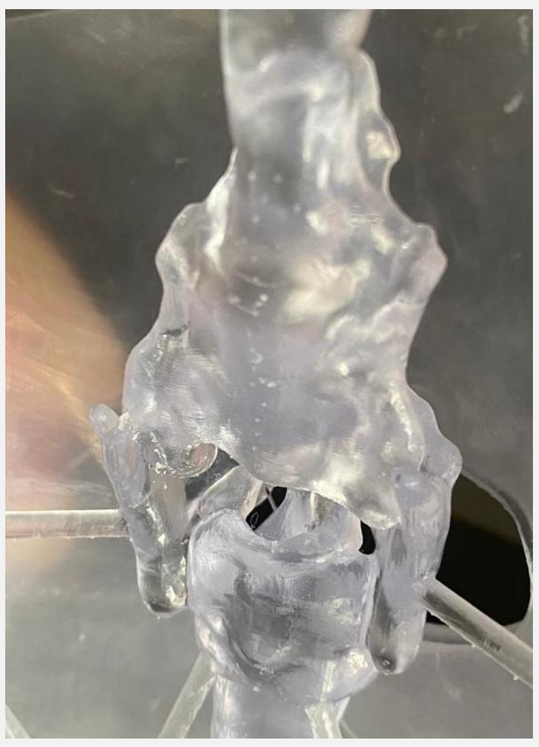

Figure 2. 3D printed larynx viewed from the posterior perspective.

Figure 3. 3D printed larynx within the model of the patient's neck.

Figure 4. The needle guide placed on the neck.

Introduction

Injection of botulinum toxin for spasmodic dysphonia (SD) is typically undergone by a fellowship trained laryngologist. The objective of this case was to evaluate the feasibility of an oral and maxillofacial surgeon (OMFS) to do such injections in order to improve a patient's access to healthcare.

Case

A 36-year-old female with adductor SD has a history of good outcomes with laryngeal electromyography (EMG) guided botulinum toxin injections and point-touch technique for botulinum injections by two fellowship trained laryngologists. The patient is stationed at a remote military base in Japan without an otolaryngology provider or access to EMG. Computer-aided design (CAD) models of the neck were constructed based upon computed tomography (CT) while the patient's neck was in a predetermined fixed position. An optimized transcutaneous needle path was mapped and a needle guide with topographic landmarks based on the patient's surface as well as internal anatomy was created and 3D printed. An OMFS provider successfully injected botulinum toxin for the SD patient with a customized 3D-printed needle guide under the supervision of a fellowship trained laryngologist.

Results

Subsequent botulinum toxin injection using the needle guide by the OMFS provider resulted in similar voice improvement compared to injections by more traditional methods by fellowship trained laryngologists. Voice Handicap Index-10 (VHI-10) improved from 29 pre-injection to 9 after the injection.

Conclusion

Customized 3D-printed needle guides may be used to improve access to healthcare of transcutaneous TA botulinum toxin injections in a select patient cohort by providers who are not fellowship trained in laryngology.

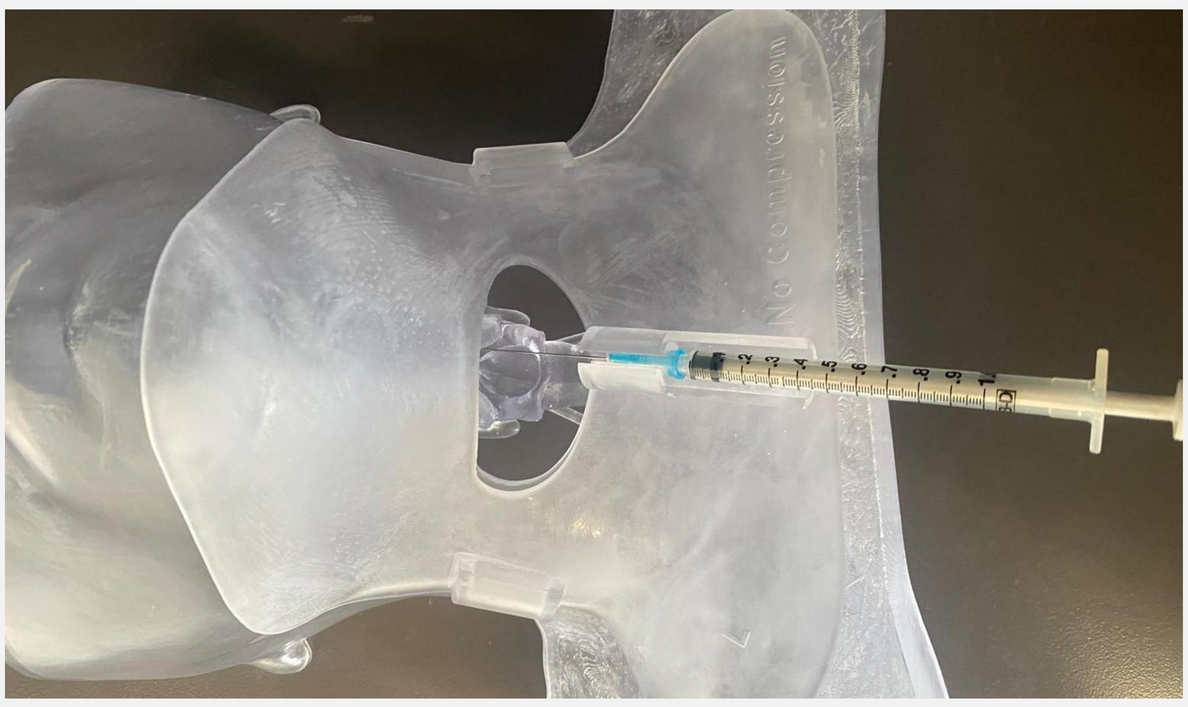

Figure 5. The guide with syringe inserted into the guide.

Acknowledgements

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