How I Do It

Double-Bend Needle Modification for Transthyrohyoid Vocal Fold Injection

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Our objective was to describe an injection needle modification for awake in-office vocal fold injections through a percutaneous transthyrohyoid approach. Two separate 45° angle bends are created at the hub and 1 cm from the needle tip of a 25-gauge, 1.5-inch needle. After adequate endolaryngeal anesthesia, the needle is passed via the thyrohyoid membrane into the airway. The needle tip is at a 90° angle to the syringe, providing access to the entire vocal fold surface, regardless of chin position or thyroid cartilage angulation. The bend at 1 cm also serves as a marker to measure the depth of the needle within the soft tissue. The double-bend needle modification allows for complete access to the entire length of the true vocal fold in one pass as well as a marker to measure depth of the needle in the tissue. Limitations may include bleeding from the injection site, insufficient needle length in patients with a long anterior-posterior dimension of the larynx, and potential difficulty passing a needle through a calcified thyrohyoid membrane.

Key Words: Transthyrohyoid, cricothyroid, transcutaneous.

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INTRODUCTION

Awake in-office vocal fold injections have become common practice for treating hoarseness related to vocal fold immobility and delivering various medications to treat other laryngeal pathology. High-magnification distal chip camera technology has more recently provided the physician with excellent visualization of the larynx with great patient tolerance. Previously described approaches to awake in-office vocal fold injections include the peroral, cricothyroid membrane, transthyroid cartilage, and most recently transthyrohyoid membrane techniques.

Getz et al. were the first to describe the percutaneous transthyrohyoid approach for vocal fold injections in the awake unsedated patient.1 Later, Amin published his series of transthyrohyoid injection augmentations, where 10-item Voice Handicap Index showed statistical improvement from a mean of 21.3 preprocedure to 7.5 postprocedure, with no reported complications among his 10 subjects.2

A reported disadvantage of this approach, however, is the inability to access the anterior aspect of the vocal folds in some patients. Bending the needle and/or turning the patient’s head have been proposed to improve the angle for better access,3 but no such modifications have been described.

A second disadvantage is the difficulty in assessing the depth of the needle tip during the injection. Needle depth is often difficult to judge because there is no marker on the shaft of a regular needle, and there is no depth perception on the video monitor. Vocal fold injections require precise depth control. For example, superficial migration or inadvertent superficial injection of Radiesse (Merz Aesthetics Inc., San Mateo, CA) will result in longstanding or even permanent hoarseness.

The transthyrohyoid approach has been our preferred method to access the endolarynx. The aim of this paper was to describe our modification to the injection needle to access the entire vocal fold surface.

DESCRIPTION OF PROCEDURE

The patient is seated in the upright position. Lidocaine 2% with 0.025% oxymetazoline is sprayed into the nasal cavities for local anesthesia and vasoconstriction. Excellent endolaryngeal anesthesia is achieved by

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inj ecting 4 mL of 4% lidocaine transtracheally using a 23-gauge needle.

At this point, a 1.5-inch 25-gauge needle is bent in two locations, with the needle bevel directed caudally. Two separate 45° angle bends are created at the hub and 1 cm from the needle tip as shown in Figure 1.

An assistant holds the nasolaryngoscope (VNL-1170K; KayPentax, Lincoln Park, NJ) in place to visualize the larynx. The needle is passed through the thyrohyoid membrane just superior to the thyroid notch, perpendicular to the skin of the neck. As the needle is advanced inferior to the epiglottis, the needle tip is visualized through the mucosa below the petiole in the midline. The double bend achieves a 90° angle between the syringe and the needle tip, and therefore with the syringe perpendicular to the skin, the tip points downward onto the superior surface of the vocal folds.

Maneuvering the needle tip achieves access to both true and false vocal folds bilaterally during the same pass. The injection is tailored to the patients’ needs through visual and auditory feedback.

**DISCUSSION**

Awake office-based procedures save both time and resources compared to surgeries performed in the operating room. High-magnification distal chip camera technology provides excellent visualization during the procedure allowing precise targeting within the endolarynx. Moreover, the transtracheal lidocaine injection achieves instant anesthesia and allows for excellent patient tolerability that is invaluable for fine-tuning the voice during augmentation procedures.

In-office injections of vocal folds were first described by Bruening in 1911, with the peroral approach to the vocal folds. Dedo et al. promoted this technique in 1973, when they reported on a series of 135 patients in whom they used Teflon injections for glottal insufficiency. The procedure includes the use of a long curved injection needle through the mouth with the patient pulling on his/her tongue. Despite the reported advantage of accurate targeting of the vocal folds, patient cooperation and tolerability can limit this approach for unsedated in-office laryngeal injections. Moreover, the inability to support the long needle against intraoral structures may make the needle very difficult to stabilize during breathing or swallowing.

In 1916, Seifert proposed the percutaneous injection as an alternative to the peroral injection for unilateral vocal fold paralysis. Transthyroid cartilage and cricothyroid membrane approaches are two widely accepted and well-described percutaneous techniques. Despite using laryngoscopic guidance, both are somewhat blind techniques. The needle tip is only seen indirectly by the inferred submucosal movement. Transthyroid access may be hindered by cartilage calcification, as well as the possibility of having the needle lumen blocked by tiny pieces of cartilage. The cricothyroid membrane approach is limited to true vocal fold access only, whereas transthyroid is adequate for both true and false vocal fold injections.

A distinct disadvantage of the transthyrohyoid, according to Zeitler et al., was the inability to access the anterior true vocal fold region for injection. Pearson et al. have also reported this in their study looking at the angles of transcutaneous injections using cadaveric larynges. They concluded that the transthyrohyoid approach was inferior to the cricothyroid membrane approach for access to the anterior vocal folds.

Rees et al. reported their experience augmenting 33 patients using the transthyrohyoid approach in a total of 51 procedures. Inability to achieve an appropriate injection angle resulted in aborting six (13%) of the 51 procedures. We have adopted the transthyrohyoid as our preferred approach for awake in-office vocal fold injections. Despite reported difficulties with targeting the anterior aspect of the true vocal folds using this technique, we are able to overcome this obstacle by bending the injection needle. The above-described technique provides the laryngologist with access to the entire medial and superior surfaces of the vocal folds, as well as false vocal folds and interarytenoid region. The 90° angle between the tip and syringe provides access to the endolarynx, regardless of chin position or thyroid cartilage angulation. The second advantage of putting a bend at the distal tip of the needle is to help define the depth of the needle tip during the injection. By knowing that the distal bend is at 1 cm, the injector can measure the depth of the needle tip. This visualization is helpful when the depth of the injection requires precise and specific control. The distal bend can be made at any point along the length of the needle so that optimal depth can be achieved. We had previously reported on the voice outcomes of 25 patients who had undergone vocal fold augmentation with Restylane (Medicis Aesthetics Inc., Scottsdale, AZ) using this technique. All 25 patients tolerated the procedure well, and precise placement of Restylane was achieved.

There are some limitations to this technique. Along with previously mentioned techniques, the transthyrohyoid injection requires an assistant to operate the scope, which may pose potential logistical challenges in scheduling. Another shared limitation with other techniques, excluding the peroral, is the potential risk for bleeding at the injection site, especially with patients on anticoagulants. One must also be careful to avoid...
midline lying anterior jugular veins to prevent hematoma formation. In tall patients with large larynges, the 1.5-inch needle may not be long enough to reach the true vocal folds. Calcification of the thyrohyoid membrane may also limit access.

CONCLUSION
With adequate anesthesia, transthyrohyoid vocal fold injection is extremely well tolerated by patients. The double-bend needle modification allows for complete access to the entire length of the true vocal fold in one pass. Limitations may include bleeding from the injection site, insufficient needle length in tall patients, and the potential difficulty of passing a needle through a calcified thyrohyoid membrane.

BIBLIOGRAPHY