How I Do It

Use of the Video-Laryngoscope (GlideScope) in Vocal Fold Injection Medialization

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INTRODUCTION

Vocal fold injection medialization is a safe and effective method to treat glottic insufficiency. Two methods of injection are most widely used: transorally via suspension laryngoscopy under general anesthesia, and percutaneously or transorally via flexible laryngoscopy in the office under local anesthesia.¹

Although an office procedure can be advantageous due to procedure cost, the ability to titrate injectate, or patient factors (such as risk for general anesthesia, body habitus, and laryngeal exposure), surgeon or patient preference may tip the balance toward the operating room.¹ In some cases, adequate laryngeal exposure under general anesthesia may prove impossible with traditional equipment. For these cases, we developed a novel technique using the GlideScope video-laryngoscope (Verathon, Inc., Bothell, WA) and a curved needle for injection.

The GlideScope is a curved-blade rigid laryngoscope with a high resolution complementary metal-oxide semiconductor camera embedded along the undersurface of the blade with a 60° midblade angulation. The Macintosh-like blade is placed in the vallecula for anterior retraction. The resulting airway view is high resolution, wide angled, and magnified. Additionally, the curved laryngoscope enables exposure in the neutral “sniff” position, which obviates overextension of the neck. Once exposure of the glottis is achieved, injection can be performed using a malleable needle formed to mimic the shape of the GlideScope intubating stylet (Fig. 1).

PATIENTS AND METHODS

Five patients underwent GlideScope-assisted injection medialization at our institution. After institutional review board approval by the Medstar Health Research Institute, the clinical data and operative notes of each patient were reviewed. Each patient presented to our laryngology clinic at a tertiary medical facility with a breathy, raspy voice. Each was found to have glottic insufficiency from various etiologies (Table I). Each patient opted for medialization under general anesthesia and gave informed consent for the procedure.

TECHNIQUE

Prior to beginning the procedure, a malleable transoral injection needle (Merz Aesthetics, San Mateo, CA) was bent to mimic the curvature of the GlideScope stylet (Fig. 1). Each patient was then induced under intravenous sedation and mask-ventilated by the anesthesia team. In most cases, laryngoscopy was first attempted with traditional laryngoscopes, but ideal visualization could not safely be achieved. The GlideScope was then used to visualize the glottis (Fig. 2). Next, calcium hydroxylapatite (Radiesse Voice; Merz Aesthetics Inc.) or methylcellulose (Radiesse VoiceGel; Merz Aesthetics Inc.) was injected into the lateral aspect of the true vocal fold through the curved needle. Most patients emerged from intravenous sedation without intubation. Only patient 4 was intubated prior to emergence.

RESULTS

Injection medialization with the use of the video-laryngoscope was attempted in five patients. Although the operative field of each patient could not be visualized with traditional laryngoscopes, visualization was improved in all cases with the use of the GlideScope. In one case (patient 3), the patient’s severe fibrosis from

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radiation therapy prohibited a full view of the vocal folds, even with the GlideScope. For better anterior visualization, a flexible laryngoscope was positioned in the larynx with the GlideScope in place, and a full view of the larynx was finally achieved, permitting injection. Operative time for this case was 45 minutes, but in most cases, injection was performed in <10 minutes.

Four of the five patients (80%) had positive responses to the procedure. Patient 2 had successful exposure and injection but had no improvement in voice, though his severe sulcus vocalis rendered this outcome likely. Patient 3 had immediate improvement in voice but went on to expire from his disease a few months after treatment.

DISCUSSION

We have demonstrated a novel technique of injection medialization, which represents a compromise of the two traditional techniques. By performing the procedure in the operating room under general anesthesia, the patient’s comfort is ensured and preference is honored. By using the GlideScope, difficult laryngeal exposure can be overcome. Extreme extension and injury to the dentition can also be avoided, and the procedure can be performed with less sedation, resulting in a more efficient procedure. Traditional techniques are preferred, but this technique enabled us to overcome surgical obstacles in five particularly difficult patients.

A recent multi-institutional retrospective review of 460 injection medialization procedures performed by laryngologists at tertiary facilities showed that just over half (51%) of the procedures were performed in the office instead of the operating room. Remarkably high success rates of 99% and 97% were noted for office and operating room procedures, respectively.1 The most common reason for failure in awake patients was patient discomfort, though other reasons for aborting the procedure included difficulty in reaching the injection site with the needle, vasovagal response, and edema secondary to antecedent laryngeal electromyography. Only one attempt in the operating room was unsuccessful due to difficulty obtaining access.1

Laryngeal exposure may be difficult for myriad reasons, as described by Benjamin and Lindholm.2 Examples of anatomical considerations include a history of

<table>
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<th>Case</th>
<th>Age (yr)</th>
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<th>Underlying Condition</th>
<th>Technical Constraint</th>
<th>Outcome With GlideScope</th>
<th>Voice Outcome</th>
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<tbody>
<tr>
<td>1</td>
<td>56</td>
<td>Right VFP</td>
<td>Lymphoma</td>
<td>C-spine radiculopathy</td>
<td>Successful exposure and injection</td>
<td>Improved maximum phonation time, amplitude</td>
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<td>2</td>
<td>57</td>
<td>Bilateral sulcus vocalis</td>
<td>Idiopathic</td>
<td>C-spine abnormality with limited extension</td>
<td>Successful exposure and injection</td>
<td>No improvement</td>
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<tr>
<td>3</td>
<td>59</td>
<td>Left VFP</td>
<td>Esophageal cancer</td>
<td>Radiation fibrosis</td>
<td>Required flexible bronchoscope for visualization</td>
<td>Immediate improvement but died of metastatic disease</td>
</tr>
<tr>
<td>4</td>
<td>57</td>
<td>Right VFP</td>
<td>Recent intubation</td>
<td>Prominent maxilla/incisors</td>
<td>Successful exposure and injection</td>
<td>Total improvement at 2 months</td>
</tr>
<tr>
<td>5</td>
<td>66</td>
<td>Left VFP</td>
<td>Lung Cancer, supraclavicular and mediastinal lymphadenopathy</td>
<td>Radiation fibrosis</td>
<td>Successful exposure and injection</td>
<td>Lost to follow-up</td>
</tr>
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C-spine = cervical spine; VFP = vocal fold paresis/paralysis.
radiation to the neck; poor atlanto-occipital joint or temporomandibular joint mobility; short, thick, or scarred neck; morbid obesity; cervical spine instability or fixation; maxillofacial trauma; microstomia; micrognathia; large teeth; macroglossia; or epiglottis overhang. Preoperative parameters that predict difficult exposure include neck circumference, body mass index, modified Mallampati index, hyoid-mental distance, thyroid-mental distance, sternal-mental distance, and the ratio of posterior mandibular depth to mandibular length (mandibular depth index).  

It has previously been shown that using the GlideScope for microlaryngoscopy not only decreases the stresses on the oropharyngeal soft tissues, but also improves the exposure of the anterior glottis. When the GlideScope is used, the instrument additionally affords modest magnification and a broad field of view at the distal end of the laryngoscope compared to the Miller or Macintosh intubating laryngoscopes. Another technique devised to overcome limited neck extension involves instrumentation via a channelled, flexible, fiberoptic laryngoscope passed through a laryngeal mask airway.  

Using the video-laryngoscope for purposes other than intubation is a not a new concept. It has been employed for visualization of the hypopharynx to remove foreign bodies or place nasogastric tubes. It has also been used for suspension laryngoscopy, panendoscopy for cancer staging, and for biopsies and removal of small lesions in patients with difficult laryngeal exposure. It has been noted, however, that image quality is substantially limited compared to traditional techniques, and that the curved operative field adds technical difficulty to the procedure. The video-laryngoscopy has also been used to instrument more distal aspects of the airway, including placement of dynamic airway stents for central airway obstruction by malignancy.  

While offering improved visualization of the glottis in patients with difficult anatomy, use of the video-laryngoscope has limitations compared to the traditional operating room setting. The most significant limitation precluding widespread use of the GlideScope in microlaryngologic procedures is the suboptimal camera and display of the instrument. When compared to the traditional Hopkins-rod telescope, microscope, or distal-chip flexible laryngoscope coupled with a wide-screen display, the visualization of the larynx is inferior. Additionally, the GlideScope lacks zooming capabilities for closer visualization of the true folds. The monitor of the GlideScope is also substantially smaller and has lower resolution than typical endoscopic equipment. This greatly limits the ability to perform a precise injection, as the location of the needle and its depth of penetration are more difficult to appreciate using this technique. Finally, the GlideScope lacks suspension capability and therefore does not allow for bimanual instrumentation in the larynx.  

The curvature of the GlideScope and injection needle also adds technical difficulty to the case and may cause trauma to regions outside the visual field. The surgeon must be cognizant of the oropharyngeal anatomy when guiding the needle into the surgical field. To avoid injury to the pharynx, the needle should be guided through the mouth under direct visualization; only when the needle is in the hypopharynx will the needle appear on the GlideScope monitor. The curved, flexible needle may also lessen tactile feedback, but this was not noted to a significant degree in our experience.  

CONCLUSION  
We have demonstrated that the GlideScope videolaryngoscope can be used successfully for injection medialization. Even though limitations exist compared to traditional techniques, we have found this to be a useful technique in the small minority of patients with difficult laryngeal exposure who require a procedure in the operating room. It is therefore a valuable addition to the laryngologist’s armamentarium for brief laryngeal procedures.  

BIBLIOGRAPHY  