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Research Paper

Voice outcome measures after flexible endoscopic injection laryngoplasty

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Abstract *Objective:* To report voice outcome measures after injection laryngoplasty using the transnasal or transoral flexible endoscopic technique.
Methods: A retrospective review of all patients who underwent flexible endoscopic injection laryngoplasty between June 2010 and August 2016 was carried out. Only those patients who had pre- and post-injection voice outcome measures recorded were included. Voice outcome measures recorded included perceptual voice evaluation using GRBAS, Voice Handicap Index-10 (VHI-10), maximum phonation time (MPT) and closed quotient (CQ) before and after treatment.
Results: Forty-six patients were identified, of which 32 had pre- and post-injection voice outcome measures recorded. There were 19 males and 13 females. The mean age was 56.97 years (range 20–86 years) and the most common indication was unilateral vocal fold paralysis. Thirteen patients had a transnasal flexible endoscopic injection), while 19 patients were injected transorally. Following injection laryngoplasty, there was significant improvement in the mean grade of dysphonia (2.81 *vs.* 1.22, $P < 0.01$, roughness (2.44 *vs.* 1.34, $P < 0.01$), breathiness (2.72 *vs.* 1.13, $P < 0.01$), asthenia (2.78 *vs.* 1.06, $P < 0.01$), and strain (2.44 *vs.* 1.19, $P < 0.01$), MPT (3.85 s *vs.* 9.85 s, $P < 0.01$) and mean CQ (0.19 *vs.* 0.46, $P < 0.01$). There was also a decrease in the mean VHI-10 score (33.31 *vs.* 7.94, $P < 0.01$).
Conclusion: s: Patients achieved significant improvement in both subjective and objective voice measures after flexible endoscopic injection laryngoplasty via the nasal or transoral

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route. Voice outcomes were comparable to those reported for other approaches. This technique provides an alternative approach for the management of patients with vocal fold paralysis or glottal insufficiency.

Introduction

Injection laryngoplasty was initially described by Bruening in 1908 for the treatment of unilateral vocal fold paralysis.[1] Since its inception, the indications for this technique have increased to include other etiologies of glottal insufficiency including vocal fold bowing, atrophy and paresis. With the goal of restoring the normal phonatory position of the vocal fold, various injection techniques have been described based on the clinical presentation and etiology of the glottal insufficiency. Both anatomic and technical considerations have been thoroughly discussed in the literature with emphasis on needle position and the type and amount of filler material used. In patients with unilateral vocal fold paralysis and an intact vibratory surface, the needle is usually inserted lateral to the vocal process, whereas in patients with vocal fold scarring or where there is tissue loss, the injection is usually placed more anterior and medial to restore the vibratory margin of the vocal fold.[2]

With the widespread performance of injection laryngoplasty in the office setting, various techniques and approaches have been described, all of which have shown promising results with significant improvement in both subjective and objective voice outcome measures.[3–6] The most commonly used approaches are the per-oral and percutaneous routes through the thyroid cartilage, thyrohyoid membrane, or cricothyroid membrane. The choice of approach is primarily determined by the surgeon's experience and preference, the patient's orofacial and neck anatomy, patient tolerance, and the availability of instrumentation.

Although the transnasal endoscopic approach has been previously reported for steroid injection as an alternative treatment for benign vocal fold lesions, only four articles in the literature have described the technique for vocal fold medialization.[7–10] Trask et al[7] reported 20 patients who underwent vocal fold augmentation using a transnasal endoscope which was initially designed for in-office transnasal esophagoscopy. All patients except one tolerated the procedure and adequate medialization was achieved in all cases. In 2015, Hamdan et al[9] reported subjective voice outcome measures using the transnasal approach in a group of patients with glottal insufficiency. There was significant subjective voice improvement and a reduction or complete closure of the glottal gap in all patients, though no objective voice measures were reported. More recently the transoral flexible endoscopic injection variation of the technique using the modified Guedel oral airway (Teleflex, Westmeath Ireland) has also been described.

The goal of this study is to report voice outcome measures after injection laryngoplasty using either the transnasal or transoral flexible endoscopic injection technique.

Methods

Subjects

After Institution Review Board approval was obtained, a retrospective chart review of all patients who underwent injection laryngoplasty under local anesthesia through the working channel of a flexible endoscope either transnasally or transorally between June 2010 and August 2016 was conducted. Only patients who had documentation of voice outcome measures before and after the procedure were included in the study. Not all voice outcome measures were recorded for all patients. All patients had perceptual voice evaluation preoperatively and post-operatively.

The patients' age and gender, indication for injection, material injected, site of injection and amount injected were recorded. Voice outcome measures collected included the Voice Handicap Index-10 (VHI-10)[11], perceptual evaluation using the GRBAS grading system[12], maximum phonation time, and the closed quotient. The closed quotient was defined as the number of closed frames/the total number of frames (open + closed) on videostroboscopy.[13]

Technique

With the patient awake in the sitting position, the pharynx was sprayed with 2% lidocaine. The nasal cavity was decongested and anesthetized using pledgets soaked in 1% lidocaine with epinephrine 1:100,000 mixed with oxymetazoline hydrochloride 0.1%. After several minutes, the flexible fiberoptic laryngoscope with a working channel (Karl Storz Model 11001UD1; El Segundo, CA) was introduced through either the nasal cavity or through the modified Guedel oral airway. The transoral approach was used when nasal obstruction would not allow transnasal insertion, or when the patient was on anticoagulants. Four percent lidocaine gel was applied to the dorsum and base of tongue prior to placement of the oral airway. Next, using a 1.8 mm Teflon catheter (BTC Medical Europe Srl, Valeggio sul Mincio, Italy)passed through the working channel, 2 ml of 2% lidocaine were applied above the palate, at the epiglottis and at the vocal folds while the patient is asked to phonate. Once the endolarynx was adequately anesthetized, a 19-gauge flexible endoscopic needle (BTC Medical Europe Srl, Valeggio sul Mincio, Italy) was passed through the working channel of the endoscope and inserted either lateral to the vocal process in cases of unilateral vocal fold paralysis, or in the mid-portion of the vocal fold lateral to the vocal ligament in cases of vocal fold atrophy or volume loss, and hyaluronic acid (Restylane®, Galderma