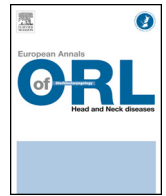




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Original article

Functional assessment of glottal insufficiency treated by hyaluronic acid injection: Retrospective 20-case series

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ABSTRACT

Objectives: The objectives of the present study were to describe hyaluronic acid injection to the vocal folds as treatment for glottal insufficiency, assess indications and report vocal results at 1 month and later than 6 months postoperatively.

Patients and methods: A single-center retrospective study was performed for the period March 2012 to August 2015. Inclusion criteria comprised: unilateral recurrent nerve palsy or vocal fold closure defect with conserved mobility. Exclusion criteria comprised: previous thyroplasty, severe swallowing disorder, and cognitive disorder hindering subjective vocal assessment. Restylane® injection was performed under general or local anesthesia. The Vocal Handicap Index (VHI), maximum phonation time (MPT) and GRBAS (Grade, Roughness, Breathiness, Asthenia, Strain) score were assessed preoperatively and at 1 month and more than 6 months postoperatively.

Results: Twenty patients were included: 14 with unilateral recurrent nerve palsy and 6 with vocal fold closure defect. Restylane® injection was performed under general anesthesia in 16 patients and local anesthesia in 4 (20%). At 1-month assessment, there was significant reduction in VHI (by 36 points; $P=0.0001$) and GRBAS score (by 6.95 points; $P=0.0001$) and significant increase in MPT (by 4.95 sec; $P=0.0001$). At 6 months, VHI, MPT and GRBAS scores remained significantly improved (respectively, $P=0.0002$, $P=0.001$ and $P=0.0001$), without significant difference from 1-month levels. Three patients had minor complications; two recovered normal vocal fold mobility.

Conclusion: Hyaluronic acid injection was effective in treating glottal failure, improving objective and subjective vocal parameters, which remained satisfactory even 6 months postoperatively.

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1. Introduction

Dysphonia related to glottal insufficiency is a common problem in phoniatrics. It may result from unilateral vocal fold palsy or paresis or vocal fold closure defect with conserved mobility. When primary speech therapy fails to provide sufficient vocal improvement, interventional treatment is indicated. There are two approaches: increasing vocal fold volume with bulking substances [1], or external surgery such as thyroplasty or arytenoid adduction, which are definitive solutions requiring an operative room procedure.

Hyaluronic acid is absorbed within 3 to 6 months [2–4]. The main indications for injection to the vocal folds comprise: unilateral palsy or paresis when recovery is uncertain, vocal fold atrophy (presbyphonia), and glottal insufficiency due to vocal fold scarring

(secondary to partial cordectomy or due to sulcus vocalis), when definitive injection is not indicated despite severe vocal disability.

The objective of the present study was to describe hyaluronic acid injection to the vocal folds, and assess indications and vocal results at 1 and more than 6 months postoperatively, with comparison to results in the literature.

2. Material and methods

A single-center retrospective study was performed for the period March 23, 2012 to August 21, 2015. Inclusion criteria comprised: dysphonia due to unilateral recurrent nerve palsy or to vocal fold closure defect with conserved mobility in which treatment was indicated for severe functional impact correlating with closure defect on flexible endoscopy despite well-conducted speech therapy. Exclusion criteria comprised: history of thyroplasty, inability to fill out the voice-quality questionnaire, and associated severe swallowing disorder. Initial work-up comprised the Voice Handicap Index (VHI), the non-computerized version of the GRBAS

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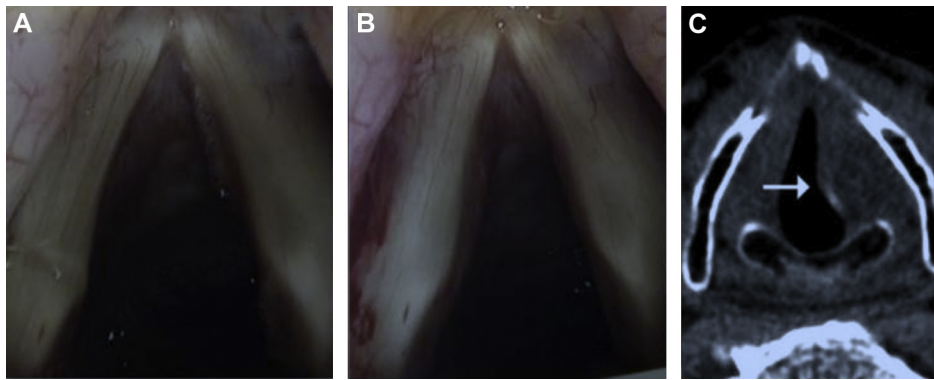


Fig. 1. Endoscopic view of left laryngeal palsy. A. Aspect before injection. B. Aspect after Restylane® injection to the left vocal fold. C. CT aspect after Restylane® injection to the left vocal fold.

(Grade, Roughness, Breathiness, Asthenia, Strain) subjective vocal assessment score (from 0 = normal to 3 = severely abnormal), and objective maximum phonation time (MPT) measurement (maximum vocal emission of a sustained/a/sound, measured manually with a chronometer). Vocal assessment was performed by two of the department's senior phoniatic practitioners.

Highly reticulated slow absorption hyaluronic acid (Restylane®) was injected following Rosen [5]: anteriorly to the vocal apophysis and at the junction between the anterior two-thirds and posterior third of the vocal fold. Restylane® was supplied by our institution, and not charged to the patient. Injected volume varied between patients according to residual glottal space, without over-correction, until satisfactory vocal fold curvature was achieved (Fig. 1). For injection under general anesthesia and direct laryngoscopy, the patient was positioned supine, with the head at a slight angle. An oxygen tube was introduced nasally to subglottal level so as not to hinder visualization of the glottal space. Local glottal anesthesia was performed ahead of surgery, using 1% Xylocaine spray. Discharge was authorized after at least 6 hours in the absence of complications, with simple analgesics.

In some particularly compliant patients, hyaluronic acid could be injected under local anesthesia of the nasal cavities, using Xylocaine Naphazoline® pledgetts. On withdrawing the pledget, the operator located the injection point, in the thyroid cartilage notch. After applying antiseptic to the injection area, 1–2 cc Xylocaine 1% was injected adjacent to the thyroid cartilage notch. The assistant performed flexible endoscopy with a probe equipped with an operator channel to aspirate secretion and perform local glottal anesthesia by Xylocaine 1% injection. The assistant positioned the endoscope above the glottis and the operator began the procedure under video-endoscopic control. A 29-gauge needle placed adjacent to the thyroid cartilage notch crossed the thyrohyoid membrane and foot of the epiglottis, then reached the vocal fold, for injection at the same site as in general anesthesia. The patient remained under surveillance for 1 hour after injection performed in consultation; return home was then authorized in the absence of complications.

The preoperative study parameters were demographic (age, gender, active or past smoking, etiology, and pathologic side) and phoniatic (MPT, VHI and GRBAS). Intraoperative parameters comprised type of anesthesia (general or local), injected quantity of hyaluronic acid (in cc), and any complications. Postoperative parameters, at 1 and >6 months, were MPT, VHI and GRBAS; vocal fold mobility and continued increase in volume were assessed on flexible endoscopy. Statistical analysis used Wilcoxon signed ranks test for matched samples to assess difference in the various preoperative, 1-month and >6-month parameters. The significance threshold was set at $P < 0.05$.

3. Results

3.1. Preoperative data

Twenty-eight patients received laryngeal hyaluronic acid injection during the inclusion period, 20 of whom met the inclusion criteria: 1 patient suffered early death from global heart failure 2 months post-injection; 2 were excluded for history of thyroplasty, 1 for severe swallowing disorder, and 4 for lack of postoperative data. All included patients had had preoperative speech therapy. Mean age was 60.35 years (range, 39–85 years); F/M sex ratio was 1:3 (5 female, 15 male) (Table 1). Surgical indications comprised unilateral recurrent nerve palsy in 14 patients (70%): idiopathic in 4 cases (20%), secondary to thyroidectomy in 6 (30%) and to thoracic surgery in 3 (15%), and to severe cranial trauma in 1 patient (5%). Indications were for vocal fold closure defect with conserved mobility in 6 patients (30%): secondary to laryngeal oncologic surgery (cordectomy) in 3 cases (15%), and related to presbyphonia in 3 (15%). Mean interval between diagnosis of dysphonia and surgery was 25.85 months (range, 2–96 months). Mean preoperative VHI was 57/120 (range, 18–81), MPT 7.35 sec (range, 0–13 sec) and total GRBAS 9.35 (range, 4–11).

3.2. Intraoperative data

Hyaluronic acid injection to the vocal fold was performed under general anesthesia in 16 patients (80%) and office-based local anesthesia in 4 (20%) (Table 1). The mean quantity of Restylane® injected was 0.56 cc (range, 0.2–1.9 cc). In 1 patient, the substance spread into Reinke's space, impairing efficacy.

3.3. Early postoperative data (Table 2)

Postoperative speech therapy was systematic. Injection was performed on an outpatient basis in 13 patients (65%): 4 in consultation, 8 in the operative room; only 7 patients (35%) required overnight surveillance. One-month assessment showed systematic significant objective and subjective vocal improvement. Mean postoperative VHI (available for 19/20 patients) was 21.37/120 (range, 0–55): i.e., a significant mean reduction of 36.31 points ($P = 0.0001$). Mean postoperative MPT was 12.3 sec (range, 5–30 sec): i.e., a significant gain of 4.05 sec ($P = 0.0001$). Mean total GRBAS was 2.4 (range, 0–8): i.e., a significant mean reduction of 6.95 points ($P = 0.0001$); on individual parameters, there was a significant mean reduction in G, B and S (respectively, $P = 0.0001$, $P = 0.0003$ and $P = 0.0043$), with non-significant trends for reduction in R and A. Adverse postoperative effects were found in 2 patients (10%): 1

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