

# Guest Editorial

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## INJECTION LARYNGOPLASTY-GAINING FAST MOMENTUM IN OFFICE-BASED LARYNGOLOGY



In life, we often witness a full circle of events. Laryngology too seems to be witnessing a full circle. Horace Green, today considered the Father of American Laryngology, described in 1852, the removal of a laryngeal polyp in an 11-year-old child in New York, using natural sunlight and a bent tongue spatula.<sup>1</sup> Local mucosal anesthesia (cocaine) was developed for the larynx by Koller and Jelinek, which facilitated substantial advancements in endolaryngeal mirror-guided surgeries.<sup>2</sup> Manuel Garcia, an Opera teacher, who was able to visualize his own vocal folds with the aid of two mirrors and reflected sunlight is credited with the discovery of mirror laryngoscopy in 1854. However, many scientists had made attempts to visualize the larynx earlier, Levret (1743), Bozzini (1807), Cagniard de la Tour (1825), Senn (1827) and Avery (1844). However, none of these scientists had been able to utilize the imaging to provide valid concepts in human voice production like Garcia had in 1855.<sup>2</sup>

Over the years, laryngology has grown in leaps and bounds and we have witnessed super-precise laser and robotic surgery under general anesthesia. However, what has also been gaining increased acceptance and popularity in the world of voice restoration seems to be injection laryngoplasty performed as an office procedure.

The principal reasons responsible for the popularity of returning to office-based procedures, seem to be, decreased costs, associated with no hospitalization and increased patient compliance, due to less time needed to be taken off work for the patient. Injection laryngoplasty (IL) also owes its popularity to advances in injectable materials as well as more efficient flexible laryngoscopes, such as the chip-on-tip laryngoscope.

### Indications

IL is the injection of a substance, typically in the paraglottic space, so as to bulk up and augment the injected vocal fold. The common indications for this procedure to be performed are unilateral immobile vocal fold with a small phonatory gap, vocal fold paresis and presbyphonia with bowed vocal folds.

The technique of transoral IL and percutaneous, thyrohyoid membrane IL may be used for injecting various therapeutic agents (cidofovir, avastin, botulinum toxin and steroids) into the subepithelial space of the vocal folds for varying indications, such as recurrent respiratory papillomatosis, adductor spasmodic dysphonia and scarred vocal folds.

### Techniques

IL may be performed perorally or percutaneously. Most laryngologists prefer and get accustomed to one way, however, it is important to be familiar with both routes. Patients who have a thin neck and strong gag reflex are ideal candidates for the percutaneous route and patients with a short, fat neck are easier done via a transoral route. In either situation, the involvement of an experienced colleague is something that can make or break the success of the procedure.

### Anesthesia

Anesthetizing the larynx well is especially important, when the needle will enter the larynx, i.e. the transoral or thyrohyoid IL. The patient is sprayed with 4 or 10% lidocaine followed by a 'laryngeal gargle' with the lidocaine. This gargle may be via the side channel of the flexible scope, intratracheal injection, dripping lidocaine with a curved injection needle over the larynx, sequential lidocaine soaked patties applied to the larynx or lidocaine nebulization. A maximum of 7 to 8 ml of 4% lidocaine may be safely used in an adult patient.

While using the transthyroid or cricothyroid route, simply spraying the nose and throat with lidocaine suffices.

### Position and Equipment

The patient is ideally in a sitting position, bending forward with neck and head extended (sniffing position). We prefer to put a nasal prong supplying oxygen via one nostril and measurement of the patients SPO<sub>2</sub> during the procedure.

A flexible laryngoscope with good optics, preferably one with a suction channel is essential for percutaneous procedures along with a no. 21-23 injection needle for transthyroid, no. 25 for thyrohyoid and no. 27 for the cricothyroid route. A rigid or flexible scope with a no. 27 transoral curved needle is needed for the transoral route. A recording and viewing system is essential for the assistant to hold the laryngoscope such that the larynx is always adequately in view. The operating surgeon also injects viewing off the monitor.

## Transoral IL

The patient is asked to hold their own tongue or an assistant may hold it. The operating surgeon usually holds the rigid laryngoscope in the nondominant hand and the curved no. 27 needle in the dominant hand. The injection may also be performed viewing the larynx via a flexible laryngoscope, though this is a less popular method. The points of injection may change depending on the indication, however, typically the false vocal fold is retracted laterally with the help of the needle itself and the injection is placed in the paraglottic space. The point of injection is usually at the point of transection of the superior arcuate line with a line anterior to the vocal process of the arytenoid.<sup>3</sup> A second injection may be made anterior to the first, if found necessary. Injections performed for presbyphonia are usually bilateral. The amount injected varies from 0.4 to 0.8 ml per vocal fold. However, this varies depending on the gender, phonatory gap and material being used and the final decision is made after hearing the voice of the patient. Usually an extra 0.2 ml is injected to account for postinjection absorption. Around 3 to 5 mm of the needle tip is inserted for optimal results.

## Percutaneous IL

A flexible laryngoscope is used to visualize the larynx. Three routes may be used for the injection as follows:

- a. Thyrohyoid membrane
- b. Transthyroid cartilage
- c. Cricothyroid membrane

The skin in the area of needle introduction is prepared with spirit and anesthetized with 1 to 2% lidocaine. The length of needle required for these injections varies from 14 to 16 mm so a one and half inch needle suffices.

### Thyrohyoid Membrane Percutaneous IL

This technique was first described by Dr Milan Amin.<sup>4</sup> Many surgeons consider this one of the simplest approaches to the larynx as the needle is easily seen once it pierces the petiole of the epiglottis. Care should be taken to keep the tip of the flexible scope high up so that it does not get inadvertently damaged. A no. 22-25 needle is usually recommended depending on the material being injected, with insertion just above the thyroid cartilage notch in the midline. The needle once inserted is directed acutely downward and the patient may be asked to move their chin in the opposite direction to allow for unimpeded needle insertion. Slight bleeding due to insertion of the needle through the epiglottis does take place. Occasionally, the needle bends during manipulation and it is then challenging to direct it as desired.

### Transthyroid Cartilage Percutaneous IL

When the thyroid cartilage has not ossified, this is a relatively easy route to use. A no. 21, 22 or 23 needle is used to bore into the cartilage about 2 to 3 mm from the lower border and 5 to 7 mm from the midline. Once the bulge of the needle is seen on the monitor, it can be directed as desired for the injection. Entry of the needle tip into the larynx is to be avoided so that a tract for implant extrusion is not available. If the cartilage is ossified, a boring action allows the needle to go through the outer and inner table of thyroid cartilage. Occasionally, the tip of the needle may get blocked by bits of the cartilage.

### Cricothyroid Membrane Percutaneous IL

A no. 27 needle is used in this technique, where the needle is introduced via the cricothyroid membrane and channeled directly upward via the infraglottic surface of the vocal fold to the paraglottic space. Considerable expertise is needed as the tip of the needle entering from the subglottis is not easily visualized.

## Injection Materials Available

### *Fat*

Though fat is free and readily available, it does not allow for an office injection, due to the high pressure required for injection and cumbersome process involved in its preparation. The results with fat are unpredictable due to the variable amount that may get dissolved postprocedure. Usually, fat that finds some vascular supply, lasts permanently. In my experience, fat that survives 3 to 4 months, survives permanently.

### **Hyaluronic Acid (Esthylase, Restylane, Perlane)**

Hyaluronic acid is readily available in India, at a cost of INR 9,000 to 13,000 and usually lasts from 6 weeks to 6 months.

### **Micronized Alloderm (Cymetra) and Bovine Collagen (Zyderm II)**

Not readily available in India and chances of allergic reaction with bovine collagen.

## **Radiesse Voice Gel**

Made of carboxymethylcellulose, lasts from 2 to 3 months.

## **Calcium Hydroxyapatite (Radiesse)**

Calcium hydroxyapatite in carboxymethylcellulose carrier is now available in India at a cost of INR 20,000 to 25,000 and lasts longer than hyaluronic acid. However, if Radiesse is injected in the subepithelial space, the stiffness caused will result in a suboptimal voice and may even have to be surgically removed. When Radiesse is used in patients of laryngeal malignancy, the enhancement in follow-up CT scans may confuse and interfere with diagnosis of recurrence of laryngeal malignancy.

Teflon is not recommended for injection due to the granuloma formation that often takes place as a delayed complication. Saline may occasionally be used as a test injection to evaluate voice improvement following IL prior to injecting a more permanent substance.

## **Complications of IL**

Implant migration, wrong placement, overinjection, respiratory distress, underinjection, infection and granuloma formation are the possible complications of these procedures. Selection of appropriate implant material and route depending on individual case merits, along with training, are ways to bring down the complication rate.

## **Contraindications**

IL should not be performed on patients with a compromised airway or those with an allergic reaction to the implant material. Patients on blood thinners are considered a relative contraindication.

## **Future**

Research being performed to create bioengineered superficial lamina propria and stem cells that may be injected safely into the vocal folds, both for augmentation and in the management of scar tissue is something to look forward to. The future looks promising not only in terms of injection laryngoplasty but also in general for office procedures in laryngology. It may not be a far off dream to have a laryngologist replace scar tissue or augment postcordectomy larynx within minutes in the office.

## **REFERENCES**

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**Nupur Kapoor Nerurkar**  
Laryngologist, Bombay Hospital,  
Mumbai, Maharashtra, India  
[www.mumbaivoicesurgeon.com](http://www.mumbaivoicesurgeon.com)