

# Direct phonoplasty under local anaesthetic

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## Abstract

**Objective:** A new technique of direct phonoplasty under local anaesthetic is described.

**Background:** Vocal-fold medialization is an accepted method to improve voice in patients with a paralysed vocal fold. Various materials have been used to inject into the paralysed vocal fold, resulting in medialization of the fold and improved phonation. The two established methods are direct injection under general anaesthetic and transcutaneous injection under local anaesthetic; both have advantages and disadvantages.

**Method:** A Pentax 80K series flexible endoscope is used to directly inject collagen into the paralysed vocal fold via a reusable 23G endoscopic needle under local anaesthetic.

**Conclusion:** New technology and innovation have allowed development of the new technique of direct phonoplasty under local anaesthetic. This combines the advantages of transcutaneous injection under local anaesthetic and direct injection under general anaesthetic, without their disadvantages.

**Key words:** Vocal Cord Paralysis; Anaesthetics, Local; Surgical Procedures, Operative; Endoscopy

## Introduction

Medialization of the paralysed vocal fold is used to improve the voice in patients with unilateral vocal fold palsy.<sup>1–3</sup> The paralysed vocal fold lies in a semi-abducted position, hanging slightly lower than its counterpart.<sup>4</sup> The concept of the treatment is to medialize the paralysed vocal fold, facilitating its apposition with the mobile vocal fold during phonation, thus improving the voice.

There are two established techniques of vocal-fold medialization by an injection method. It may be performed with direct laryngoscopy under a general anaesthetic or via a transcricothyroid membrane injection under local anaesthetic. Both techniques have their advantages and disadvantages.

Technological advances in digital, computer and flexible endoscopic technology have allowed the authors to develop a novel method of vocal-fold medialization by direct injection under local anaesthetic. This technique has several advantages over the established methods.

## Methods

### Instruments

A Pentax 80K series digital video endoscope is used. This is a 5.1 mm diameter endoscope incorporating a high-resolution colour CCD chip in its tip, enabling excellent, full-screen images of high definition to be viewed on the monitor. As well as being able to perform suction and irrigation, insufflation (or, indeed, ventilation with oxygen) is also possible. The endoscope also has a 2.2 mm instrument channel, allowing passage of the reusable endoscopic 23G needle used for injection; the needle length is 13 mm with a 1.8 mm external diameter.

### Pre-operative assessment and consent

In the pre-operative assessment clinic patients undergo pre-operative laryngographic assessment. The procedure is discussed initially with the patients in the out-patient clinic, and informed consent is obtained in the day-case unit.

### Anaesthesia

The nose is first prepared with two sprays of lignocaine hydrochloride (5 per cent)/phenylephrine (0.5 per cent) aerosol solution applied to each nostril; 3 ml Instagel (containing 2 per cent lignocaine) is then applied to both the anterior nares. The remaining 5 ml Instagel is used as a lubricant on the endoscope itself, providing further topical analgesia. The oropharynx is then sprayed with a further two sprays of lignocaine (10 per cent) aerosol solution via the mouth. The larynx is anaesthetized directly with 2 ml 4 per cent lignocaine, which is sprayed directly onto the vocal folds via the endoscope. A 21G (pink) venflon is also inserted for intravenous access, using topical EMLA cream (lignocaine).

### Procedure

The endoscope is passed transnasally to the larynx, where the vocal folds may be visualized on a television monitor. The endoscopic needle, primed with collagen for injection, is passed down the instrument channel. The authors use Zyplast<sup>®</sup> collagen; this is a bovine dermal collagen that is lightly cross-linked with glutaraldehyde and is dispersed in phosphate-buffered saline containing 0.3 per cent lignocaine. With direct vision of the paralysed vocal fold, the surgeon is then able to inject directly onto the superior surface. The collagen is injected precisely into the vocal fold until it lies in the desired position (Figures 1,2,3). The patient phonates, allowing immediate feedback to determine the amount of collagen required.

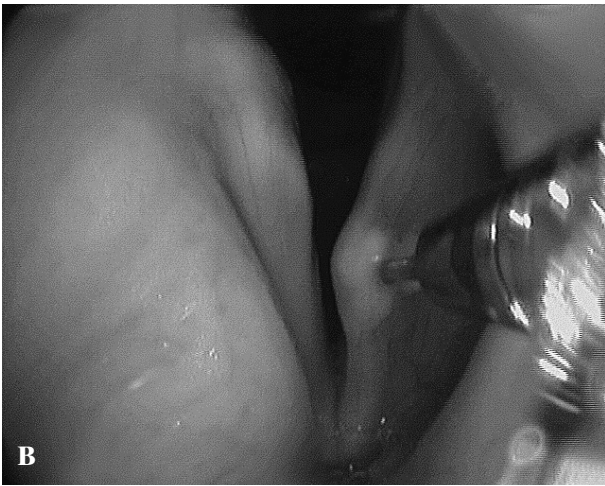
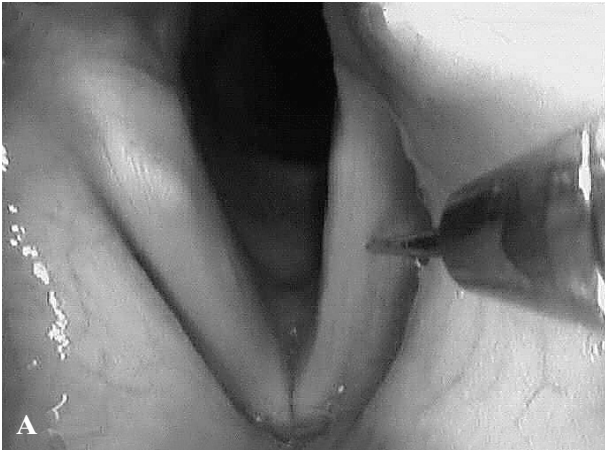


FIG. 1

(a) Abducted paralysed left vocal fold. (b) Injecting left vocal fold. (c) Medialized left vocal fold on phonation.

*Recovery*

Since the procedure is performed under local anaesthetic, the patient is able to eat and drink as normal soon after the effects of the local anaesthetic have worn off.

*Post-operative*

The results of the procedure are instantaneous, with the patient's voice subjectively improving, which allows feedback as to the amount of collagen to be injected. Good



FIG. 2

Passage of TNFLO to the larynx.



FIG. 3

Injection directly into the vocal cord

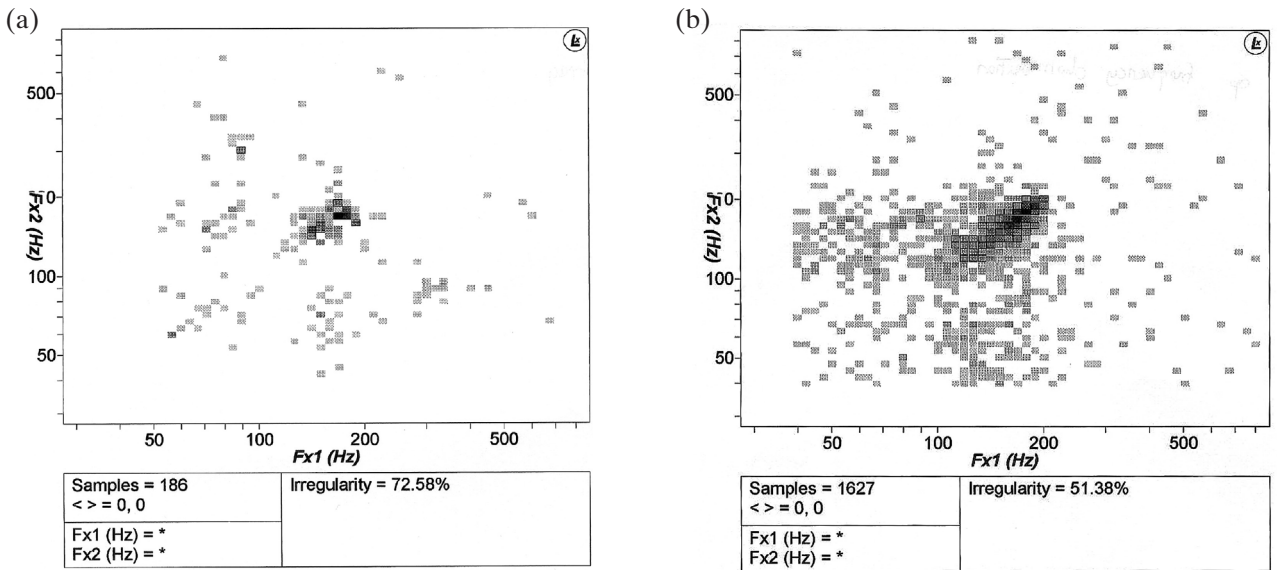


FIG. 4

(a) Pre-operative frequency distribution of irregularity. (b) Post-operative frequency distribution of irregularity.

apposition of the vocal folds may also be seen on the digital monitor (Figure 1c).

Laryngographic assessment of the voice post-operatively is used to confirm an objective improvement in the quality of the voice.

### Example

In the patient shown in Figure 1, the pre-operative frequency of irregularity of the vocal folds was high at 72.58 per cent. Post-operatively, the frequency of irregularity fell to 51.38 per cent as the vocal folds were better apposed during phonation and successive periods of vocal fold regularity were markedly more frequent (Figure 4).

### Discussion

Direct visualization of the vocal folds via an operative laryngoscope under a general anaesthetic gives a good view of the area to be injected. The surgeon looks directly at the vocal folds<sup>5</sup> and is able to inject into the superior surface of the fold.

The principal disadvantage of this technique is that the surgeon can only estimate the amount of injected material to be delivered, as the patient is unconscious and thus unable to phonate. In addition, the patient themselves may not be fit for a general anaesthetic. This technique may also be impossible in patients with limited cervical spine extension.

The current alternative is transcricothyroid injection of the vocal fold, under local anaesthetic in an out-patient or day-case setting. A simple flexible nasolaryngoscope is passed down to the larynx; a collagen-primed needle is passed through the cricothyroid membrane, into the subglottic area, and infiltrates the vocal fold from below. The surgeon is able to see the bulking effect on the television monitor and obtain feedback of phonation from the awake patient.

The primary disadvantage of this procedure is that there is limited access to the anterior glottis due to the curvature of the transcricoid needle. Furthermore the operator does not directly visualize the point of injection as it is underneath the vocal fold. The injection from an

inferior point also causes a bulking effect of the inferior surface of the vocal fold rather than of the more optimal superior surface.

A literature review revealed that the technique of direct phonoplasty under local anaesthetic has not been previously described. It is an original and innovative approach to vocal-fold medialization without the disadvantages of both established techniques, whilst maintaining their advantages. There are no restrictions on placement of the needle; the anterior commissure is easily reached. Injection can be performed in an accurate and controlled manner to the superior surface of the vocal fold. Bulking of the superior surface is more appropriate as this results in a greater area of mucosal apposition between both vocal folds on phonation. The benefit of local anaesthetic is that the patient is able to give immediate feedback.

A total dose of 350 mg of lignocaine (Table I) is given topically to the upper aerodigestive tract during the procedure, providing excellent anaesthesia and thus allowing the procedure to be well tolerated. In direct phonoplasty the doses of topical anaesthetic are safe. It is thought that topical local anaesthetic is mainly swallowed and absorbed in the gut, and then almost completely metabolized by first-pass metabolism in the liver. The toxic topical dose is therefore different from the toxic intravenous dose of local anaesthetic. The toxic plasma level of lignocaine is 5.0 mg/l; it has been demonstrated that a topical dose of 9 mg/kg of

TABLE I  
DOSES OF TOPICAL ANAESTHETIC

	Lignocaine (mg)
4 sprays lignocaine (5%)/phenylephidrine (0.5%) to nose	26
6 ml Instagel (lignocaine 2%) to nose	120
5 ml Instagel (lignocaine 2%) on endoscope	100
2 sprays lignocaine (10%) to mouth/oropharynx	20
2 ml lignocaine (4%) sprayed onto larynx	80
1–2 ml Zyplast <sup>®</sup> (lignocaine 0.3%)	4 (approx)
Total topical dose	350



lignocaine may be safely administered to the upper aerodigestive tract, resulting in a mean peak plasma concentration of 2.9 mg/l,<sup>6</sup> e.g. a 70 kg patient could safely be administered 630 mg of topical lignocaine before receiving a toxic dose.

### Conclusion

New technology has allowed development of the novel technique of direct phonoplasty under local anaesthetic. This procedure combines the advantages of transcricothyroid injection under local anaesthetic and direct injection under general anaesthetic, without their disadvantages.

Direct phonoplasty is effective, well tolerated, safe and can be performed in the out-patients department or day-case surgery unit.

### References

- 1 Sato K, Umeno H, Nakashima T. Autologous fat injection laryngohypopharyngoplasty for aspiration after vocal cord paralysis. *Ann Otol Rhinol Laryngol* 2004;**113**:87–92
- 2 Havas TE, Priestly KJ. Autologous fat injection laryngoplasty for unilateral vocal cord paralysis. *A N Z J Surg* 2003;**73**:938–43
- 3 Alves CB, Loughran S, MacGregor FB, Dey JI. Bioplastique medialisation therapy improves the quality of life in terminally ill patients with vocal cord palsy. *Clin Otolaryngol* 2002;**27**:387–91
- 4 Rontal E, Rontal M. Permanent medialization of the paralyzed vocal cord utilizing botulinum toxin and Gelfoam. *J Voice* 2003;**17**:434–41
- 5 Rontal E, Rontal M, Morse G, Brown EM. Vocal cord injection in the treatment of acute and chronic aspiration. *Laryngoscope* 1976;**86**:625–34
- 6 Efthimiou J, Higenbottam T, Holt D, Cochrane GM. Plasma concentrations of lignocaine during fiberoptic bronchoscopy. *Thorax* 1982;**37**:68–71

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