The Journal of Laryngology & Otology (2009), ***123***, *873–876.*
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doi:10.1017/S0022215109004629

Main Article

Early results for treatment of unilateral vocal fold palsy with injection medialisation under local anaesthetic

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Abstract

Background: The diagnosis and treatment of unilateral vocal fold palsy is a common part of otolaryngology practice. In those patients in whom resolution of symptoms is slow, the resulting dysphonia can have a dramatic effect on the patient's quality of voice and life. We have previously described the procedure of direct phonoplasty under local anaesthesia using the transnasal laryngoesophagoscope.

Objective: To examine the subjective and objective data for the first five patients to undergo this procedure, in the form of laryngographic speech analysis, perceptual assessment and therapy outcome measures.

Results: Analysis showed a statistically significant improvement in voice quality, in all the above assessment categories, following local anaesthetic direct phonoplasty using the transnasal laryngoesophagoscope.

Conclusion: Collagen injection via transnasal flexible laryngoesophagoscopy is a particularly useful technique for treating vocal fold medialisation, especially in palliative care patients and those with shortened life expectancy.

Key words: Vocal Cord Paralysis; Endoscopy; Larynx; Injections

Introduction

Unilateral vocal fold palsy can be a disabling condition. The resulting dysphonia is characterised by a breathy, asthenic voice, and the palsy may contribute to dysphagia if the vocal folds are widely abducted or there is a degree of associated sensory loss within the larynx.[1]

Treatment of vocal fold palsy is aimed at medialising the paralysed fold in order to improve phonation and subsequent quality of life.[2–4] Two established methods of medialisation by injection are: direct injection of the vocal fold under general anaesthesia; and external injection through the cricothyroid membrane under local anaesthesia.[2–4]

Within our department, we have developed a technique allowing internal injection medialisation of a vocal fold under local anaesthetic using the transnasal flexible laryngoesophagoscope.[1] Here, we present our experience and results for the first five patients undergoing this procedure.

Methods

A detailed description of the procedure has been published previously.[1] We used a 5.1 mm diameter transnasal flexible laryngoesophagoscope with a 2.2 mm diameter operating channel incorporating a high resolution charge-coupled device chip in its tip, connected to a standard endoscope stack and monitor.

All patients were treated within the out-patient department, utilising a standard technique. Informed consent was first obtained. The nose and pharynx were then prepared. Firstly, two sprays of lignocaine (5 per cent) and phenylephidrine (0.5 per cent) were applied to each nostril. This was followed by application of 3 ml Instillagel (2 per cent lignocaine; Clini-Med Limited, Buckinghamshire UK, HP10 9QY) to each nostril. The oropharynx was anaesthetised with two sprays of lignocaine (10 per cent) aerosol via the mouth. The remaining Instillagel was used to lubricate the endoscope.

The endoscope was passed transnasally to obtain an excellent view of the larynx. Two millilitres of 4 per cent lignocaine was sprayed directly onto the vocal folds via the operating channel of the endoscope.

The vocal fold was injected using a 23 G endoscopic needle passed through the operating channel. We injected Zyplast collagen (bovine dermal collagen; Zyplast®, McGhan Medical Corporation, Fremont, CA, USA) which is lightly cross-linked with glutaraldehyde and dispersed in phosphate-buffered saline containing 0.3 per cent lignocaine.[1] The collagen was injected under direct vision into the superior surface of the vocal fold until it lay in the desired position. The patient was

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Accepted for publication: 27 October 2008. First published online 2 March 2009.

https://doi.org/10.1017/S0022215109004629 Published online by Cambridge University Press

then asked to phonate, enabling immediate feedback to determine the amount of medialisation required.

All the patients involved were assessed by a specialist speech and language therapist immediately prior to and six weeks after the procedure. Assessment involved the patient reading a passage of two minutes' duration, and giving a two-minute conversational speech sample and also a sustained vowel sample. Two patients' initial post-operative results showed no significant improvement in their vocal function (patients one and four), and they were referred for repeat transnasal flexible laryngoesophagoscopy and collagen injection, with further assessment being carried out three to six weeks later.

Multidimensional voice outcome testing was used in this study, comprising: instrumental assessment (using laryngograph speech studio analysis);[5] perceptual assessment (using the grade-roughness-breathiness-asthenicity-strain scale);[6] and therapy outcome measurement.[7,8]

Instrumental assessment using the laryngograph allowed objective measurement of voice quality.

Perceptual assessment with the grade-roughness-breathiness-asthenicity-strain scale allowed subjective evaluation of the severity of dysphonia, utilising a four-point rating scale of zero (normal) to three (extreme) for five parameters (i.e. overall severity of voice abnormality, roughness, breathiness, asthenia or weakness, and strain).[6]

Therapy outcome measurement used subjective scores based on the World Health Organization definitions of impairment, disability handicap and well-being.[7,8] These are based on a six-point scale of zero (severe) to five (no impairment), providing an indication of quality of life.[7,8]

The two-tailed, paired *t*-test was used to assess the statistical significance of results.

Results

Patients' diagnoses and demographics are given in Table I. There were no complications, and all patients left the department within a few hours of the procedure. Two patients (patients one and four) required a second procedure to improve their voice quality.

Laryngograph speech studio analysis

Data on laryngographic analysis are given in Table II. There was wide variation in fundamental frequency changes. Two patients (one and four, both male) experienced a dramatic rise in pitch, two patients (patients two and three, both female) demonstrated a mildly raised pitch and one patient (patient five) moved from a falsetto voice to a male modal voice. Improvements were noted in all parameters. Statistically significant improvements were found in contact quotient ($p = 0.006$), maximum phonation time ($p = 0.0013$), shimmer ($p = 0.003$) and irregularity ($p = 0.036$).

TABLE I

PATIENT DEMOGRAPHICS AND DIAGNOSES

Patient	Age (yrs)	Sex	Diagnosis	Palsy side
1	72	M	Small cell Ca lung	L
2	64	F	Lobular Ca breast	L
3	89	F	Idiopathic	L
4	81	M	Iatrogenic (post-thyroidectomy for multinodular goitre)	R
5	72	M	Idiopathic	L

Yrs = years; M = male; F = female; Ca = carcinoma; L = left; R = right

Perceptual analysis

Results for perceptual analysis are shown in Table III. Analysis confirmed that all but one patient (patient two) experienced a significant reduction in the overall severity of their dysphonia, and perceived only mild or very minimal dysphonia following the procedure. There was a significant improvement for all patients (i.e. reduction) in overall grade-roughness-breathiness-asthenicity-strain scale score ($p = 0.003$).

Therapy outcome measures

Results for therapy outcome measurement are shown in Table IV. All of our patients presented with moderate to severe impairment of vocal function due to their vocal fold paralysis. As a consequence, they experienced moderately severe disability in terms of effortful, ineffective voice production that was limited to modified environments (e.g. quiet or familiar situations). Patients one and five were also significantly handicapped by their situation, experiencing extremely low self-confidence and social isolation. Following intervention, they rapidly returned to near-normal functioning. This was also the case, to differing degrees, for the other three patients. Comparison of overall scores both before and after treatment demonstrated significant improvement in patients' quality of life ($p = 0.006$).

Discussion

It is well recognised that treating dysphonia due to unilateral vocal fold palsy, within the context of malignant disease, can vastly improve a patient's quality of life.[2–4,9,10] The injection techniques used have traditionally involved either direct injection under general anaesthetic or trans-cricoid injection under local anaesthetic.[2–4,9–11] Direct injection has the advantage of direct vision, but several disadvantages.[2–4,9–11] Direct, rigid laryngoscopy requires general anaesthesia and an in-patient hospital stay.[2–4,9–11] Rigid endoscopy also introduces the risk of dental damage and mucosal abrasion or perforation.[2–4,9–11]

External, trans-cricoid injection is performed under local anaesthetic by injecting the vocal fold from below whilst visualising from above with a nasendoscope.[1] The procedure can be performed on an out-patient basis, and the patient can provide feedback by phonating on demand.[1] However, the technique allows only limited access to the anterior glottis, and the operator cannot directly see the point of injection.[1]

https://doi.org/10.1017/S0022215109004629 Published online by Cambridge University Press

TABLE II

LARYNGOGRAPH SPEECH STUDIO ANALYSIS[5]

Patient	Time point	Fundamental frequency (Hz)	Contact quotient (%)	Jitter	Shimmer	Irregularity (%)	Max phonation time (s)
1	Pre-op	76	27	52	38	81	<1
	Post-op 1	121	26	64	45	56	1
	Post-op 2*	148	38	21	18	28	6
2	Pre-op	167	23	62	47	81	1.2
	Post-op	187	28	53	30	44	5
3	Pre-op	148	39	13	15	20	6
	Post-op	190	45	6	13	8	9
4	Pre-op	91	34	37	40	41	3.5
	Post-op 1	177	33	26	23	56	2.1
	Post-op 2*	167	40	18	20	28	9.7
5	Pre-op	265	49	80	19	86	0
	Post-op	148	53	20	18	9	9

*After repeat procedure Max = maximum; s = seconds; pre-op = pre-operative; post-op = post-operative

We have previously described our technique enabling collagen injection of a vocal fold under local anaesthetic, utilising transnasal flexible laryngoesophagoscopy.[1] The procedure is well tolerated, as illustrated by our two patients (patients one and four) who willingly underwent repeat procedures. The procedure combines the advantages of treatment under local anaesthetic (as with trans-cricoid injection) with those of injection of the vocal fold under direct vision.[1]

We present the results of our first five patients treated in this fashion. Two patients in this series

TABLE III

PERCEPTUAL ANALYSIS SCORES (GRBAS SCALE)

Patient	Time point	Overall severity	Roughness	Breathiness	Asthenicity	Strain	Total
1	Pre-op	3	2	3	2	2	12
	Post-op 1	3	2	3	2	2	12
	Post-op 2*	1	1	1	1	0	4
2	Pre-op	2	2	2	1	2	9
	Post-op	2	2	1	0	1	6
3	Pre-op	2	2	2	2	2	10
	Post-op	1	0	1	0	0	2
4	Pre-op	3	2	3	1	3	12
	Post-op 1	3	2	2	1	2	10
	Post-op 2*	2	2	1	0	1	6
5	Pre-op	3	2	3	3	2	13
	Post-op	1	1	1	1	1	5
Mean change		−1.2	−0.8	−1.6	−1.4	−1.6	−6.6

Grade-roughness-breathiness-asthenicity-strain (GRBAS) scale scores: 0 = normal, 1 = mild, 2 = moderate, 3 = severe. *After repeat procedure. Pre-op = pre-operative; post-op = post-operative

TABLE IV

THERAPY OUTCOME MEASURE SCORES

Patient	Time point	Impairment	Disability	Handicap	Pt's well-being		Total
					Patient	Carer	
1	Pre-op	1	2	1	0	1	5
	Post-op 1	1	2	1	0	1	5
	Post-op 2*	3	4	4	4	4	19
2	Pre-op	2	2	3	3	3	14
	Post-op	3	3	4	4	4	18
3	Pre-op	2	2	3	3	3	13
	Post-op	4	5	5	5	5	24
4	Pre-op	2	2	2	3	3	12
	Post-op 1	2	2	2	3	3	12
	Post-op 2*	3	4	4	4	4	19
5	Pre-op	1	1	1	1	1	5
	Post-op	4	3	3	4	4	16
Mean change		+1.2	+2	+2	+2.2	+2	+9.4

Scores ranged from 0 (=severe) to 5 (=no impairment). *After repeat procedure. Pt = patient; pre-op = pre-operative; post-op = post-operative

https://doi.org/10.1017/S0022215109004629 Published online by Cambridge University Press

had repeated procedures due to poor response to the first treatment. Both were keen to have a second procedure and responded well. This demonstrates one of the major advantages of our technique, that is, allowing repeated courses of treatment with minimal trauma or inconvenience until patient satisfaction is achieved. This procedure is able to be performed in an out-patient setting, without the need for day-procedure or in-patient admission, and, in our experience, provoked no adverse reactions. Therefore, it has advantages in terms of immediate, subjective assessment of voice quality, procedure time, bed occupancy, patient tolerance and repeatability.

Objective, instrumental analysis of our patients demonstrated results comparable to those of more conventional techniques.[5–8] Zagolski and Carlson have reported that measures of irregularity best represent vocal fold dysfunction in patients with unilateral vocal fold palsy.[12] We demonstrated consistent reductions in these scores.

- **Unilateral vocal fold palsy is a disabling condition which results in dysphonia characterised by a breathy, aesthenic voice, as well as a poor quality of life**
- **In patients whose dysphonia does not resolve, or whose life expectancy is limited (as with palliative care patients), treatment can be aimed at medialising the paralysed vocal fold in order to improve phonation**
- **The authors used a technique of endoscopic injection via the transnasal flexible laryngoesophagoscope, and present results for their first five patients treated**
- **A dramatic improvement in quality and quantity of phonation was seen in all patients**

Perceptual analysis using the grade-roughness-breathiness-asthenicity-strain scale revealed significant improvements in subjective evaluation of voice quality following treatment.[6] All but one patient (patient two) experienced a reduction in the overall severity of their dysphonia. However, patient two viewed a mild reduction in vocal breathiness, weakness and strain as a most satisfactory outcome, although her moderate degree of roughness persisted.

Perhaps the most revealing indicators of success were the therapy outcome measures. These assessments reflected the differing impacts of treatment on the health of the individual.[7,8] We demonstrated consistent improvements in therapy outcome scores in all patients in all categories, including the patients' carers' assessments of patients' well-being. Patient two, who reported no change in the overall severity of her dysphonia, according to the grade-roughness-breathiness-asthenicity-strain scale, nonetheless reported improved quality of life on 'patients' carers' assessments of patients well-being' scale.

Conclusion

Overall, our results demonstrate that the collagen injections resulted in a significant improvement in our patients' unilateral vocal fold palsy, as assessed by objective measures of voice quality. Our findings also demonstrated that such treatment reduced patients' perceptions of dysphonia and as a consequence facilitated improved social functioning and improved mental health.

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Mr R Pratap takes responsibility for the integrity of the content of the paper.
Competing interests: None declared

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