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Is voice therapy an effective treatment for dysphonia? A randomised controlled trial

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Editorial by Carding

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Abstract

Objectives To assess the overall efficacy of voice therapy for dysphonia.
Design Single blind randomised controlled trial.
Setting Outpatient clinic in a teaching hospital.
Participants 204 outpatients aged 17-87 with a primary symptom of persistent hoarseness for at least two months.
Interventions After baseline assessments, patients were randomised to six weeks of either voice therapy or no treatment. Assessments were repeated at six weeks on the 145 (71%) patients who continued to this stage and at 12-14 weeks on the 133 (65%) patients who completed the study. The assessments at the three time points for the 70 patients who completed treatment and the 63 patients in the group given no treatment were compared.
Main outcome measures Ratings of laryngeal features, Buffalo voice profile, amplitude and pitch perturbation, voice profile questionnaire, hospital anxiety and depression scale, clinical interview schedule, SF-36.
Results Voice therapy improved voice quality as assessed by rating by patients ($P = 0.001$) and rating by observer ($P < 0.001$). The treatment effects for these two outcomes were 4.1 (95% confidence interval 1.7 to 6.6) points and 0.82 (0.50 to 1.13) points. Amplitude perturbation showed improvement at six weeks but not on completion of the study. Patients with dysphonia had appreciable psychological distress and lower quality of life than controls, but voice therapy had no significant impact on either of these variables.
bConclusion Voice therapy is effective in improving voice quality as assessed by self rated and observer rated methods.

Introduction

Many patients have transient, self limiting changes in voice, but those who have been hoarse for more than three weeks need specialist assessment to exclude underlying laryngopharyngeal pathology. Once conditions that need surgery have been excluded, patients are usually referred to a speech and language therapist for voice therapy. Up to 40 000 patients with dysphonia are referred for voice therapy annually in the United Kingdom.[1] At the time of referral, many patients with vocal dysfunction have entered a vicious cycle in which psychological factors exacerbate voice pathology and poor voice quality adversely affects psychological wellbeing.[2–9]

We aimed to examine the efficacy of voice therapy in patients with dysphonia and to identify those patients for whom voice therapy might be most beneficial.

Participants and methods

We recruited consecutive outpatients attending the department of otorhinolaryngology and head and neck surgery of Glasgow Royal Infirmary with a primary complaint of dysphonia (hoarseness) present for a minimum of two months and without any relevant organic pathology (for example, polyp, papilloma, tumour, vocal cord palsy) or need for surgery.

The inclusion criteria were age greater than 16 years, motivation to resolve the voice problem, and willingness to enter into regular voice therapy sessions. The exclusion criteria were previously treated dysphonia, neurological disease, or upper aerodigestive tract malignancy; marked hearing impairment; acid reflux; multiple medical complaints; professional voice user requiring urgent intervention; puberphonia; and transsexual conflict.

Measures

Pathophysiology—An otolaryngologist (KMacK) used a flexible nasolaryngoscope to assess four features—nodule formation, laryngitis, glottic escape, and hyperfunction of the laryngeal musculature—on a four point (0-3) rating scale.

Voice quality—A digital tape recording of the patient's reading of the phonetically balanced "rainbow" passage (a standard paragraph used in voice assessment) was analysed by a speech and language therapist blind to treatment group.[10 11] The same therapist also extracted two key objective measures of voice quality—"jitter" (pitch perturbation) and "shimmer" (amplitude perturbation)—by using the Computerised Speech Laboratory (model 4300B; Kay Elemetrics Corp, NJ). The higher the score on these two variables the more dysphonic the voice. Patients rated their own voice quality using the validated vocal performance questionnaire,[12] with five point scoring on 12 items (1-5, 5 = worst).

Psychological measures—The interviewer rated 14 aspects of non-psychotic psychiatric disturbance. The clinical interview schedule's overall distress score[13] and the hospital anxiety and depression scale's anxiety score[14] were the key outcome measures of psychological distress.

Quality of life was assessed by the SF-36.[15]

Intervention

Baseline data were recorded after eligibility had been assessed and consent had been obtained. The participants were then seen by one speech and language therapist (CS), who obtained a number for random allocation of the participant to either a course of voice therapy or a period of observation. All voice therapy was delivered according to a protocol (see long version on bmj.com).[16] Researchers involved in collecting outcome data were blind to details of the treatment. After six weeks of therapy or observation, data on pathophysiology, voice quality, psychological status, and quality of life were recorded. After a further 6-8 weeks, all measurements were repeated, and the clinical interview schedule was conducted.

Before the study, the intended number of patients to be recruited in the treatment and non-treatment groups was determined by assuming a medium effect size of treatment (0.5 SD units). This is a conservative effect size compared with that indicated in the available literature. The target chosen was 100 patients in each group, which offered 94% power with α set at 0.05.

Statistical analysis

Analysis of each outcome was conducted only on patients with complete data. Statistical analyses compared the mean difference in the outcome variables between the groups with and without treatment. We used an analysis of covariance procedure with group (treatment versus no treatment) as a between patients variable; we used people's baseline scores on the particular variable being compared as covariates for both the end of treatment and follow up analyses.

Assessment of the effect of voice therapy on pathophysiological outcomes needed a categorical approach. We subtracted ratings for each pathophysi-

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Table 1 Mean (SD) scores for key voice and psychological variables at each visit for treatment and no treatment groups (patients with complete data)

	Treatment			No treatment				
Test or questionnaire	No of patients	Visit 1 (baseline)	Visit 2 or 3	No of patients	Visit 1 (baseline)	Visit 2 or 3	F value	Treatment effect (points (95% CI))
At completion of treatment (visit 2)								
Psychological distress:								
HADS anxiety	67	6.3 (4.0)	5.9 (4.5)	63	8.1 (4.3)	7.7 (3.9)	0.71 (P=0.402)	0.39 (–0.53 to 1.31)
HADS depression	67	3.7 (3.5)	3.6 (3.7)	63	4.2 (3.3)	4.2 (3.1)	0.38 (P=0.540)	0.25 (–0.55 to 1.05)
CIS total score	67	7.0 (6.9)		62	8.6 (8.2)			
Voice:								
Buffalo overall rating*	74	2.9 (1.1)	2.3 (0.93)	69	2.9 (1.0)	2.5 (0.93)	2.33 (P=0.130)	0.21 (–0.01 to 0.49)
Pitch perturbation†	67	3.2 (2.4)	2.8 (1.5)	57	2.4 (1.4)	2.8 (1.5)	0.97 (P=0.326)	0.25 (–0.25 to 0.74)
Amplitude perturbation†	67	6.0 (4.2)	4.5 (2.6)	57	5.0 (3.3)	5.7 (3.8)	8.03 (P=0.005)	1.6 (0.47 to 2.63)
VPQ total‡	67	27.6 (8.0)	22.4 (5.8)	65	27.9 (7.5)	25.4 (8.1)	6.12 (P=0.015)	2.6 (0.51 to 4.63)
At completion of follow up (visit 3)								
Psychological distress:								
HADS anxiety	62	6.6 (4.0)	5.9 (3.8)	56	8.1 (4.0)	6.7 (4.1)	0.00 (P=0.969)	0.02 (–1.21 to 1.25)
HADS depression	62	4.2 (3.6)	3.8 (3.5)	56	4.2 (3.3)	4.3 (3.6)	1.08 (P=0.300)	0.4 (–1.3 to 0.39)
CIS total score	67	7.0 (6.9)	7.3 (8.1)	62	8.6 (8.2)	7.6 (8.8)	0.64 (P=0.424)	0.89 (–1.3 to 3.06)
Voice:								
Buffalo overall rating*	70	2.9 (1.1)	2.2 (1.0)	63	2.8 (1.0)	3.0 (1.0)	26.50 (P<0.001)	0.82 (0.5 to 1.13)
Pitch perturbation†	65	3.1 (2.4)	2.7 (1.5)	54	2.4 (1.4)	2.2 (1.5)	1.58 (P=0.212)	0.35 (–0.20 to 0.89)
Amplitude perturbation†	65	5.8 (3.9)	4.1 (3.0)	54	5.1 (3.2)	4.5 (3.6)	0.90 (P=0.345)	0.57 (–0.62 to 1.77)
Score on VPQ‡	61	28.8 (8.2)	21.6 (6.3)	57	28.0 (7.5)	25.4 (8.5)	10.96 (P=0.001)	4.14 (1.67 to 6.61)

HADS=hospital anxiety and depression scale; CIS=clinical interview schedule; VPQ=vocal performance questionnaire.
*Buffalo voice profile analysis has an "overall rating" as 1 of 10 items scored 0-5.
†The higher the score the more dysphonic the voice.
‡Maximum score=60; the higher the score the more dysphonic the voice.

Table 2 Mean (SD) scores for quality of life (SF-36) variables at each visit for treatment and no treatment groups (patients with complete data). Higher scores indicate better health

	Treatment			No treatment				
	No of patients	Visit 1 (baseline)	Visit 2 or 3	No of patients	Visit 1 (baseline)	Visit 2 or 3	F value	Treatment effect (points (95% CI))
At completion of treatment (visit 2)								
Physical functioning	63	66.7 (32.6)	66.6 (34.0)	65	64.3 (31.0)	64.9 (30.3)	0.01 (P=0.92)	0.33 (–6.25 to 6.90)
Social functioning	63	78.0 (25.7)	81.1 (26.4)	62	70.7 (28.5)	73.9 (27.6)	0.45 (P=0.50)	2.5 (–4.89 to 9.88)
Role (physical)	63	63.1 (43.7)	59.1 (45.0)	62	54.0 (40.8)	47.9 (42.1)	0.79 (P=0.38)	5.6 (–6.94 to 18.22)
Role (emotional)	63	78.3 (38.4)	72.2 (41.0)	63	62.7 (42.4)	64.0 (42.9)	0.03 (P=0.87)	1.0 (–11.44 to 13.45)
Mental health	63	71.5 (18.1)	76.9 (18.3)	63	65.1 (19.5)	66.1 (20.1)	6.08 (P=0.02)	6.63 (1.31 to 11.95)
Energy/fatigue	63	55.3 (20.7)	59.8 (21.4)	63	48.6 (22.2)	50.8 (23.3)	2.03 (P=0.16)	3.95 (–1.54 to 9.44)
Pain	62	64.1 (28.8)	69.0 (28.5)	60	59.7 (23.1)	62.0 (30.6)	0.87 (P=0.35)	3.96 (–4.44 to 12.36)
Health perception	58	64.9 (23.4)	66.5 (25.5)	63	57.7 (23.1)	59.9 (23.5)	0.01 (P=0.93)	0.24 (–4.76 to 5.24)
At completion of follow up (visit 3)								
Physical functioning	59	67.7 (31.8)	69.1 (30.2)	56	64.6 (30.5)	64.1 (30.4)	0.55 (P=0.46)	2.5 (–4.19 to 9.19)
Social functioning	58	77.4 (25.9)	78.2 (26.1)	55	74.0 (25.1)	72.9 (28.4)	0.55 (P=0.46)	3.11 (–5.18 to 11.4)
Role (physical)	60	62.5 (44.5)	61.7 (43.5)	55	50.5 (40.7)	51.4 (44.5)	0.18 (P=0.67)	2.86 (–10.34 to 16.06)
Role (emotional)	60	76.7 (39.5)	70.8 (40.1)	56	57.5 (42.9)	58.3 (45.5)	0.03 (P=0.87)	1.07 (–12.26 to 14.41)
Mental health	58	70.8 (18.6)	74.7 (17.8)	55	65.2 (19.8)	67.9 (19.7)	1.58 (P=0.21)	3.66 (–2.12 to 9.44)
Energy/fatigue	58	54.6 (20.4)	56.1 (24.6)	55	49.5 (21.2)	51.0 (23.6)	0.07 (P=0.80)	0.81 (–5.45 to 7.06)
Pain	56	62.2 (28.5)	60.7 (29.0)	56	61.3 (23.9)	55.8 (28.7)	1.04 (P=0.80)	4.29 (–4.03 to 12.6)
Health perception	55	63.2 (23.7)	65.0 (25.8)	55	58.4 (24.0)	59.3 (26.0)	0.28 (P=0.60)	1.46 (–4.02 to 6.94)

ological feature for each patient at the end of treatment (visit 2) from those at baseline (visit 1); we also subtracted ratings for each feature at the end of follow up (visit 3) from those at visit 1. We then assigned patients to a category (0, 1, or 2) according to whether they had improved, deteriorated, or stayed the same. We performed a series of χ^2 intergroup comparisons.

We calculated treatment effects as mean differences at the relevant outcome (visits 2 and 3) controlled for baseline scores in the respective measure. We used general linear modelling in SPSS 9/10 to perform the analysis.

Results

Of the 204 patients who gave informed consent for inclusion, 100 patients were randomised to voice therapy and 104 to no treatment. By completion of the study 12-14 weeks later, about a third of participants had dropped out or been excluded, leaving 70 patients in the treatment group and 63 patients in the observation group. As expected, most patients in both groups were women (50/72 (69%) in the control group and 56/73 (77%) in the treatment group); the groups were closely matched for age (mean (SD) age in the control group 52 (13) years and 51 (14) years in the treatment group). Laryngeal features at study entry were similar in the intervention and control patients. Grade 2-3 (moderate to severe) scores were uncommon for all of the four features, and only minimal resolution of the abnormalities occurred between the two time points.

The groups were well matched at entry to the study for subjective and objective voice variables. The treatment and no treatment groups differed at baseline only on the hospital anxiety and depression scale anxiety scores, which were higher in the control group. This difference between the treatment and no treatment groups was evident in the original 204 randomised recruits and in the 133 patients who completed all three phases of the study.

Effectiveness of voice therapy

By the end of treatment voice therapy significantly improved self rated quality of voice and the measurement of amplitude perturbation or "shimmer" by the Computerised Speech Laboratory. At follow up the patients in the treatment group had significantly lower scores than those in the no treatment group on the Buffalo overall rating and the voice profile questionnaire total score. Treatment effects (points) and 95% confidence intervals were calculated for each of the outcome variables at both completion of treatment and completion of follow up (tables 1 and 2). All participants with data at baseline and follow up were included. For the voice profile questionnaire the effect was 4.1 points (effect size 0.54 SD). For the Buffalo scale the effect was 0.82 points (effect size 0.76 SD). In conventional statistical terminology these are medium to large effects. Voice therapy had an effect on only one quality of life outcome variable—mental health. This was significantly better in the treatment group at completion of treatment but not at completion of follow up.

To address the issue of dropout we re-ran the analyses including all patients with data at baseline. For patients with missing data at visit 2 or visit 3 we entered the baseline values. On reanalyses of the sensitivity scores, treatment effects (points), and confidence intervals for each of the outcome measures, the results retained their significant P values and treatment effects.

Discussion

This first randomised controlled trial of the efficacy of voice therapy for dysphonia has shown voice therapy to be effective in improving self rated and expert rated quality of voice. The magnitude of the observed mean improvements reflects clinically meaningful improvements in voice quality. The minimal change in laryngoscopic appearances during the study reflects the fact that many of the patients referred for non-surgical

What is already known on this topic

Many patients with dysphonia are treated by voice therapy

The effectiveness of voice therapy in a diverse group of patients is unknown

What this study adds

Voice therapy is an effective treatment for dysphonia in terms of report by patients and perceptual ratings by an expert

Psychological distress and reduction in general health status are common in patients with dysphonia but are not significantly affected by a course of voice therapy

voice therapy have, by definition, relatively normal laryngeal appearances.

The voice therapy and no treatment groups were not significantly different in terms of either rate of attrition (30% in the therapy group, 39% in the no treatment group) or characteristics of patients who dropped out (sociodemographic variables or baseline voice or psychological variables). Thus, we believe that the attrition did not introduce bias.

Psychological distress was not significantly reduced as a result of treatment. Voice therapy had a significant effect on one quality of life variable—mental health—at the end of treatment, but this was not maintained at follow up. A subgroup of patients remain psychologically distressed despite receiving treatment. Speech and language therapists often use psychological strategies but often acquire psychological training after qualification and in what has been described as an ad hoc manner.[17] If patients with high psychological distress could be identified by screening they could be referred for psychological intervention, perhaps from a clinical psychologist.[18]

The disconcertingly abnormal SF-36 results highlight the importance of effective vocal communication for an individual's psychosocial wellbeing. Indeed, the level of psychological morbidity may also mainly reflect the greatly reduced quality of life in patients with dysphonia. Such interrelations underline the importance of a holistic treatment for reduction in symptoms and improvement in overall functioning.

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The derivation of names

Among the oldest words of any language are the names of rivers and mountains. In Western Europe these are commonly from the ancient Celtic language from which Welsh is derived. Apart from Basque, Welsh is the oldest living language of Western Europe, and Welsh speakers can often see the link between the old Celtic tongue and the names of waterways and land formations. Malvern is a good example. The Malvern hills are a striking feature of the Worcestershire countryside, rising steeply from the western rim of the Severn plain and devoid of trees, and the area inspired the work of Elgar. Malvern is derived from two Welsh words, *moel* and *bryn*, meaning "bare hill."

For several years, Professor Ann Farmer, a psychiatric colleague, worked at a clinic in Pontypridd, and most of her patients came from the Rhondda Valley. It is a typical example of the old Welsh mining landscape—a narrow valley, running north to south, steep sided with overhanging mountains. When she referred to her catchment area of "Ronda," I could only think of the romantic town in southern Spain, Ronda, the home of bullfighting, and its links with Ernest Hemingway. I had not been there. My only connection with it was a picture on our living room wall. This captures the essence of the town—its clear light, the views, and the distinctive whitewashed buildings with their characteristic black iron window grills.

Recently, I visited Andalucia. Ronda certainly lives up to its reputation. Its location is striking, set astride the 100 metre deep El Tajo gorge amid the beautiful Serrania de Ronda mountains. Our guide told us about its history and that its name was not Spanish or Andalucian but from the old Celtic language of Iberia, and that Ronda means "the mountains are all around." Clearly it is the same word as the name of our mining valley in south Wales.

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