

Paparella: Volume III: Head and Neck

Section 2: Disorders of the Head and Neck

Part 5: The Larynx, Trachea, and Esophagus

Chapter 34: The Role of Speech Therapy in Voice Disorders

Joseph C. Stemple

The invention of the laryngoscope by a Parisian singing instructor, Manuel Garcia (1854), enabled the larynx to be well visualized for the first time. This permitted accurate diagnosis for pathologic conditions of the laryngeal mechanism. Over the years, these disorders have been treated in a diverse manner, ranging from topical applications of sprays and gargles to microsurgery and laser surgery using direct laryngoscopy.

Around 1930, several diverse groups of professionals became interested in retraining the voices of individuals with voice disorders as an adjunct to medical management. These professionals included otolaryngologists, singing teachers, theater instructors, and teachers in the speech arts. Using drills and exercises borrowed from training manuals designed for the normal speaker, these specialists attempted to modify the production of the disordered voice in an effort to resolve the pathologic condition.

These early pioneers in the nonmedical remediation of voice disorders eventually became part of a group of communication specialists known as "speech correctionists". The goal of this group was to aid individuals with any form of speech, language, voice, or hearing disorder. These specialists soon formally organized and today have grown into the 45,000-member American Speech-Language-Hearing Association. Professional members are certified speech-language pathologists or audiologists, or both; with graduate masters or doctoral degrees in these specialities. Extensive study in the areas of laryngeal anatomy and physiology, disorders of voice, acoustics, and psychology, as well as therapeutic methods, have prepared these speech pathologists to evaluate and correct many voice disorders. This chapter is designed to describe the speech pathologist's role in the management of voice disorders.

Voice Evaluation

A voice disorder occurs when the acoustic attributes of pitch, loudness, or quality differ from an acceptable norm. The listener's criterion is the basis for this judgment, with the best judge normally being the owner of the voice. Sometimes there may be organic disorders caused by structural alterations of the vocal mechanism. At other times, voice disorders have a functional origin caused by some form of vocal misuse. Speech pathologists may be involved to varying degrees in the remediation of both types of disorders.

The entry point of a patient with a speech disorder to voice therapy is always through a referring physician. It is always necessary that an indirect laryngoscopy be performed before any therapy is initiated so that the physician and the speech pathologist may plan the most appropriate management program.

A formal voice evaluation is then conducted by the speech pathologist to determine the cause or causes of the voice disorder. The evaluation includes information regarding the history of the specific voice problem, associated medical history, and measurements and descriptions of the present acoustic attributes of the voice, which include respiration, phonation, resonance, pitch, loudness, rhythm and rate, and general laryngeal area muscle tension. Once the evaluation is completed and the causes of the disorder have been identified, a management plan is developed that is designed to modify or eliminate these causative factors.

Etiology of Voice Disorders

Table 1 outlines several causative factors that may result in voice disorders.

Table 1. Etiology of Speech Disorders

Vocal Misuse

Surgery

Medical

Personality-related causes

Vocally abusive behaviors

Inappropriate vocal properties

Direct surgery (glossectomy, laryngectomy, mandibulectomy)

Indirect surgery (thyroidectomy; cardiac, lung, carotid surgery; hysterectomy)

Upper respiratory tract infections

Lower respiratory tract infections

Gastroesophageal reflux

Irritations - tobacco, alcohol, pollution, drugs

Hormonal disorders

Nervous tension

Rheumatoid arthritis

Cleft palate

Cerebral palsy

Deafness

Motor voice disorders, eg, parkinsonism

Environmental stress

Conversion disorders.

Vocal Misuse

The term *vocal misuse* implies any functional voicing behavior that may contribute to the development of a laryngeal pathologic condition. These behaviors include voice abuses, which are the most common causes of hyperfunctional voice disorders. Voice abuse occurs when phonation is produced with excessive contraction of the vocal fold adductor muscles. This may occur through excessive shouting and loud talking, as well as screaming and vocal noises. Vocal noises refer to the sound children make at play, including the roar of cars, trucks, and motorcycles, the screech of emergency sirens, and so on. Also included in this category are coughing and throat clearing. Incessant, nonproductive, habitual throat clearing

is extremely common in people in whom voice disorders develop, and this habit may develop as an unconscious response to a change in the vocal folds. Whatever the cause, this behavior must be modified or eliminated in order for voice therapy to be successful.

A second category of vocal misuse is inappropriate vocal function, which includes any abnormality of respiration, phonation, resonance, pitch, loudness, rhythm and rate, and laryngeal area muscle tension. Any inappropriate use of one or more of these functions can cause a voice disorder. For example, a shallow, non-supportive breathing pattern may strain the laryngeal mechanism during phonation, or the habitual use of a low-pitched voice may create a laryngeal pathologic condition.

Surgical Trauma

The term *surgical trauma* refers to surgical therapy that directly or indirectly results in voice disorders. Any extensive head and neck cancer surgery - for example, glossectomy, laryngectomy, or mandibulectomy - may affect phonation, resonance, or articulation. Such patients will benefit significantly from vocal rehabilitation.

Other types of surgery, however, may indirectly contribute to the development of a voice disorder; for example, thyroid, heart, lung, and carotid surgery may all result in some trauma to the recurrent laryngeal nerve, resulting in vocal fold paralysis. It has also been noted that some women who have undergone hysterectomy may have a temporary or permanent lowering of vocal pitch. This may be caused by hormonal changes or emotional conflict that the patient is experiencing, or both. Often the patient will attempt to maintain her normal higher pitch, thus straining the laryngeal mechanism. In so doing, a vocal disorder will result.

Medical Causes

Chronic medical conditions have been shown to contribute to the development of voice problems. A classic example of this is persistent postnasal drip as a result of allergies or chronic sinusitis. Although the drainage alone probably will not result in a voice disorder per se, abusive coughing and throat clearing accompanying the drainage certainly does contribute. The same voice abuses may occur in people who suffer from chronic respiratory tract infections. Patients who exhibit nervous disorders may also be candidates for vocal problems. Increased laryngeal area muscle tension caused by the nervous condition may put a strain on the laryngeal mechanism, resulting in dysphonia. Gastroesophageal reflux may result in granulation tissue or ulceration in the posterior larynx.

Hormonal imbalance, for example, myxedema, may result in hoarseness. Arthritis of the cricoarytenoid joints as a result of rheumatoid arthritis also may cause ankylosis and result in dysphonia.

In addition, chronic alcohol, tobacco, and drug abuse may directly result in chronic laryngeal problems. These substances directly irritate the vocal folds and, in addition, the incessant clearing of the throat and persistent cough only serve to compound the problem.

All of these pathologic conditions may well benefit from vocal rehabilitation after the condition has been treated medically.

Other medical disorders that may result in alteration of speech include cleft palate and velopharyngeal insufficiency, deafness that results in loud speech because of the inability to obtain auditory feedback, and cerebral palsy with its labored, monotonous, and often hypernasal voice quality. Neurogenic disorders including parkinsonism, pseudobulbar palsy, and so on may also result in abnormalities in speech.

Personality-related Causes

The final major etiologic category is that of personality-related causes of voice disorders. It is known that the way a person feels physically and emotionally is directly reflected in the voice. The tensions and stresses of everyday life contribute to the abnormal functioning of the sensitive vocal instrument.

Many examples may be given of patients who present with voice disorders as a result of environmental stress. A representative example would be the patient who presents with only a mild vocal fold edema but who complains of chronic hoarseness and tiredness in the voice after minimal use. In evaluating this patient, no vocal abuses are noted and no medically related or secondary disorders are present. This patient, however, may be depressed, and this will result in an emotional dysphonia. Chronic use of low-pitched voice with poor breath support may physically contribute to the dysphonia; however, the cause is environmental stress. At times, environmental stress may become so severe that the patient experiences conversion voice disorders. A psychologic conversion reaction is normally the result of strong interpersonal conflict. A conversion behavior enables the patient to avoid awareness of the emotional conflict or stress. Conversion voice disorders may manifest themselves as whispering, muteness, and unusual dysphonia without a laryngeal pathologic condition being present.

Voice disorders that are the result of personality-related causes are particularly amenable to voice therapy. If the improvement of voice is resistant to therapy, psychologic counseling may be recommended.

Vocal Management

The goal of a vocal management program is to return the voice to its optimum condition. This condition may be normal voicing or it may simply be an improvement of vocal quality over the initial condition. The following summary is intended to familiarize the reader with various vocal management approaches. Although it is not intended to be a clinical guide, it is hoped that some insight into voice therapy approaches and techniques will be gained.

The main purpose of the diagnostic voice evaluation is to identify the causes of the voice disorder. The first step of a management approach then is to describe these causes in detail to the patient. Often simple diagrams of the laryngeal mechanism are used in informing patients how these causes affect the condition of their vocal folds. Ways to modify or eliminate these causative factors are then explored. It is often found that this type of "vocal

hygiene counseling" is sufficient in resolving the laryngeal pathologic condition. In other words, if the cause is eliminated or changed, the effect is no longer present.

When the suspected causative factors are modified and the vocal symptoms persist, a direct symptom management approach is in order. Direct therapy treatments would be used to modify vocal properties such as breathing, phonation, pitch, loudness, and so on. This direct therapy approach is also used when the inappropriate use of a vocal property is the primary cause of the problem.

Direct Therapy Approaches

Ear Training

Although many patients are able to immediately recognize disordered phonation within their own voice production, they often forget what their normal voice was like. It is also not unusual for those presenting with a mild dysphonia to incorporate this voice as their own and to show little concern for the problem. One of the initial steps in voice therapy then is to teach the identification and discrimination of both disordered and normal voice qualities. Tape recorded samples of the patient's own voice are then evaluated and the acoustic attributes described in detail. Comparisons are made as therapy progresses.

Respiration

The majority of voice patients present with absolutely normal breathing patterns. If shallow thoracic or clavicular breathing is present and is failing to adequately support the voice, diaphragmatic breathing may be taught. Cooper (1973) described the following approach:

1. Place one hand on the chest and the other on the abdomen.
2. Inhale easily through the nose and exhale through the mouth, concentrating on inflating and deflating the abdomen with no chest movement.
3. Inhale quickly through the mouth and exhale gradually using the same abdominal method.
4. The preceding steps should be done in supine, standing, and sitting positions while incorporating phonation at appropriate pitch and loudness levels.

Phonation

Direct therapy for the property of phonation would include the elimination of "hard or glottal attacks" on initial vowel sounds, and modifications of "glottal fry phonation".

The hard or glottal attack is produced by first adducting the vocal folds at the midline, building subglottal pressure, and then initiating the vowel. This habitual pattern of phonation is mechanically abusive to the vocal folds and is modified by teaching patients to produce sounds with an easy breathy onset. This behavior is then habituated and stabilized for words

through phrases, sentences, and finally conversational speech.

Glottal fry refers to periodic vibration of the vocal folds in a lower frequency range than the normal pitch register. This low-pitched growling sound is very evident in patients who report that their voices tire easily. It is caused by a grinding motion of the arytenoid cartilages. The direct therapy approach for this vocal symptom is to raise the pitch.

Pitch

The vast majority of the time when patients are judged to have an inappropriate pitch level, the pitch is judged to be too low. There are many causes for this behavior, which include:

1. An increase to vocal fold mass caused by edema and mass lesions.
2. The development of a habitual low pitch in an attempt to sound more authoritative.
3. Emotional conflict, depression, chronic fatigue, and tension.
4. Attempts to "save" the voice that typically tires easily by talking with a reduced intensity and respiratory support.

The therapy approach for this disorder would depend upon the cause. If the low pitch is a result of vocal fold edema or lesions, they should be medically treated. If the inappropriate pitch is the primary cause, direct pitch therapy would be used and would involve the following:

1. Identification of the problem with a thorough explanation of the causes given to the patient.
2. Identification of a more appropriate pitch level (roughly one third of the way up the total pitch range).
3. Matching this level to a musical pitch pipe and then habituating by practicing words, phrases, and sentences at this level.
4. Negative practice by producing the inappropriate pitch on purpose and comparing it to the more appropriate level.

Resonation

The most common functional resonance disorder is that of hypernasality. Hypernasality is the excessive escape of air through the nasal cavity caused by improper closure of the velopharyngeal port. Once it is determined through x-ray and manometric studies that the disorder is functional, several therapy approaches may be attempted. They include the following:

1. Having the patient play with the voice, making nonspeech sounds. If any of these sounds are made without the hypernasal quality, they can be used as a starting point for ear training the patient to hear normal resonance and to physically close the velum.

2. Doing the obvious - see if the patient can "sound like you have a cold" (denasal quality).

3. Physical exercises including sucking and blowing exercises (many questions exist regarding the effectiveness of this approach).

In doing these manipulations, the positions of all the patient's articulators, resonators, and the larynx are being modified.

Loudness

An inappropriate increase in the intensity of the speaking voice, whether it be intermittent or continuous, may prove to be very abusive to the vocal folds. People with chronic dysphonia are often told that if they did not shout their voice problem would go away. Although this may often be true, it is usually much more difficult to modify this behavior than one might suppose. Homemakers shout at their children; children shout when playing; factory workers shout over noise; teachers, preachers, lawyers, and so on talk loudly for long periods in their professions. The most appropriate way of dealing with this problem is patient education. Making the patient aware of the effects of increased loudness on the laryngeal mechanism by using graphic pictures and descriptions should be the first step in modifying the behavior. The second step is establishing the reason the person increases the loudness of his or her voice. What situations required increased loudness? The final step then is to find alternatives for this behavior or, if possible, to modify the behavior by teaching the patient how to shout or talk loudly in a nonvocally abusive manner.

Some obvious substitutions or alternatives include blowing a whistle to call children, moving away from a noise source when talking, concentrating on making people strain to hear you as opposed to vocally straining to make people hear you, and if one must shout, to use a lower pitch with improved breath support, which will reduce the impact of shouting on the vocal folds.

Laryngeal Tension

Many voice disorders, especially those characterized as hyperfunctional, present with increased laryngeal area muscle tension. Tension may be intermittent, as occurs during shouting, making vocal noises, or throat clearing. It may also be persistent or habitual. The causes of tension are many and varied. Tension may be psychologically related, as with patients with emotional disorders. It may be physically related, as with people who habitually speak with a retracted tongue and an elevated larynx. Tension may also be symptomatic of a laryngeal pathologic condition, such as nodules that cause the patient to strain the laryngeal musculature to maintain vocal fold approximation.

The specific cause of the tension is first carefully and completely explained to the patient. Direct therapy approaches are then used as needed. They may include progressive

relaxation, digital massage, and electromyographic biofeedback.

Progressive relaxation implies the systematic relaxation of the body from the toes to the head. It is generally assumed that if a patient has increased laryngeal tension, whole body tension is also probably high. Once taught, this method is used easily as a home exercise.

Aronson (1980) presented a seven-step program for decreasing laryngeal tension. These steps follow:

1. Encircle the hyoid bone with the thumb and middle finger, working them posteriorly until the tips of the major horns are felt.

2. Exert light pressure with the fingers in a circular motion over the tips of the hyoid bone and ask if the patient feels pain, not just pressure. It is important to watch facial expression for signs of discomfort or pain.

3. Repeat this procedure with the fingers in the thyrohyoid space, beginning from the thyroid notch and working posteriorly.

4. Find the posterior borders of the thyroid cartilage just medial to the sternocleidomastoid muscles and repeat the procedure.

5. With the fingers over the superior borders of the thyroid cartilage, begin to work the larynx gently downward, also moving it laterally at times. One should check for a lower laryngeal position by estimating the increased size of the thyrohyoid space.

6. Ask the patient to prolong vowels during these procedures, noting changes in quality or pitch. Clearer voice quality and lower pitch indicate relief of tension. Because these procedures are fatiguing, rest periods should be provided.

7. Once a voice change has taken place, the patient should be allowed to experiment with the voice, repeating vowels, words, and sentences.

Biofeedback

The principles of biofeedback have been known and promoted now for many years. Biofeedback is the self-control of physiologic function by means of continuous, immediate, and exact information about the internal state under scrutiny. Electromyographic biofeedback permits monitoring of electrical activities of muscles and exertion of some control over these activities. This form of training permits the patient to view the tension of the general laryngeal area, and to reduce this tension using both visual and auditory feedback.

Management of Special Conditions

The treatment of some pathologic conditions requires special attention.

Throat Clearing

As mentioned previously, incessant habitual throat clearing is very abusive to the vocal folds. Elimination of this unconscious habit should be one of the first steps in any voice therapy approach. Most patients are very successful in accomplishing this when they are instructed to do the following:

1. Tell everyone around you that you are not permitted to clear your throat. When you do so, they are to immediately point this out to you. Your immediate task is to produce a forceful swallow.
2. After you have been reminded several times by others, you will begin to catch yourself. Every time you do so, swallow forcefully.

Although throat clearing affords greater relief than swallowing, it is, however, very abusive and in fact accomplishes no more than the forceful swallow. Its elimination, therefore, is a very effective first step in a vocal management program (Stemple, 1984).

Management of Conversion Aphonia and Dysphonia

Usually by the time a patient seeks help for a conversion disorder, there is no longer a psychologic need for the behavior, and the patient is ready for change. It is extremely important to remember, however, that the patient is not malingering. The patient truly believes that a more appropriate voice cannot be produced. With this in mind, the clinician asks the patient to produce a non-speech sound, such as high-pitched falsetto tone, thorax clearing, or coughing. All patients can and will produce some nonspeech phonation. When this is consistently accomplished, it is slowly transferred to speech-related material. For example, if the patient clears the throat with consistent phonation, this can be extended into "ahemm-one, ahemm-two, ahemm-three", and so on. If a patient produces a falsetto tone, it may easily be transferred to falsetto phonation of vowels and single-syllable words. As the patient repeats many words in the falsetto voice, the clinician guides the pitch level downward until normal phonation is established.

The goal of this management approach is to gain normal phonation within the first session. Probes are then made to determine the cause of the conversion behavior and thereby to determine the need for psychologic consultation.

Management for Mutational Falsetto

The failure to change from the higher pitched voice of childhood to the lower pitched voice of adolescence and adulthood is mutational falsetto. The falsetto voice is the only voice familiar to the patient. Changing the mutational voice is always attempted within one session. Therapy techniques include working from the natural, low-pitched cough or throat clearing or having the patient produce a hard glottal sound while physically holding the larynx in a lower position. Once a low-pitched sound is made in this manner, it is stretched into normal phonation using progressive speech sounds.

Discussion

This chapter has presented information regarding causative factors, laryngeal pathologic conditions, and samples of vocal management approaches. The inherent fallacy is that voice disorders usually do not occur with easily identified causes. Similar pathologic conditions may often be the result of different causative factors, and the same therapy approach may not be effective for both. However, identification of the pathologic condition and any related medical condition by the physician, and a complete voice evaluation conducted by the speech pathologist, has proved to be very effective in the management of voice problems. The patient greatly benefits from this cooperative team approach.