



Clinical Voice Pathology Theory and Management

Joseph C. Stemple

Clinical Voice Pathology

Theory and Management

Joseph C. Stemple

Private Consultant in Voice Pathology

***Merrill, an imprint of
Macmillan Publishing Company
New York***

***Collier Macmillan Canada, Inc.
Toronto***

***Maxwell Macmillan International Publishing Group
New York Oxford Singapore Sydney***

This book was set in Zapf.
Cover Design: Tony Faiola
Production Coordination and Text Design: Jeffrey Putnam

The excerpt read in several of the record samples is from "Ballad of the Sad Cafe," from *Ballad of the Sad Cafe and Other Stories* by Carson McCullers (New York: Bantam, 1967).

Copyright © 1984, by Macmillan Publishing Company. Merrill is an imprint of Macmillan Publishing Company. All rights reserved. No part of this book may be reproduced in any form, electronic or mechanical, including photocopy, recording, or any information storage and retrieval system, without permission in writing from the publisher.

Library of Congress Catalog Card Number: 83-43280
International Standard Book Number 0-675-20128-4
Printed in the United States of America

3 4 5 6 7 8 9 — 91 92 93 94

Preface

Among the most rewarding areas in the treatment of communication disorders are the evaluation and subsequent management of clinical voice disorders. Patients who are motivated to improve voice production are highly likely to succeed in modifying inappropriate vocal habits or properties, or both, thus improving their voice qualities. Since 1983 the American Speech-Language-Hearing Association has required speech pathology students to receive a minimum of 25 clock hours in the area of voice disorders. This requirement is often met with students' experiencing only minimal contact with one or two types of laryngeal disorders and with one or two patients, because patients seeking help in voice production are not common in most practicum sites. Therefore, many students complete their education feeling ill prepared to deal with the various types of voice disorders.

This voice pathology text is designed both for the preparation of the speech pathology student and as a clinical guide for the practicing speech-language pathologist. Together the text and audio recordings will enable the student and the clinician to read and listen to actual examples of diagnostic and management approaches. The text presents a major clinical orientation, and it also provides the necessary background information on anatomy, physiology, and laryngeal pathologies. This information will provide the reader with an understanding of voice production and voice disorders.

Chapter 1 presents a history of voice disorders from 1550 B.C. to the present. Chapter 2 discusses both the anatomy of the laryngeal mechanism from a regional gross-anatomy orientation and the physiology of the mechanism. Chapter 3 presents laryngeal pathologies with discussions of their etiologies and treatments. Recorded voice samples are provided for some of the more common pathologies. Chapter 4 initiates the clinical orientation of the text with a presentation of common etiologies associated with the development of voice disorders. With this knowledge, the reader

is then prepared to learn how to do a diagnostic voice evaluation (Chapter 5) and how to plan appropriate voice management programs (Chapter 6).

The seventh chapter presents some comments on the professional voice user. Salespeople, ministers, singers, actors, and the like may all be classified as professional voice users. Because of their dependence on their voices, professional voice users with voice disorders often require special considerations regarding their physical and emotional well-being and their courses of treatment. This chapter is designed to make this responsibility less threatening for the speech pathology student and clinician.

Chapter 8 presents many commercial tools and instruments designed specifically for use with patients who have voice disorders. Although not required for successful treatment, many of these instruments prove effective when used with this population.

The final chapter deals with the total rehabilitation of the laryngectomized patient and the patient's family by using an interdisciplinary team approach. Reestablishment of oral communication with artificial larynges, esophageal voice and surgical prostheses is discussed in detail. Recorded speech samples are provided.

Numerous people have contributed to the development of this text in many different ways. My own development as a clinician was initiated under the enthusiastic guidance of the late R. Vernon Stroud, Ph.D., of the University of Cincinnati. The terms *scholar*, *clinician*, *humanist*, and *activist* may all be used to describe this unique individual. His contributions to his students and thus to his field will not be forgotten.

I would like to thank Wayne Secord for his valuable support throughout this project. I would like to thank Joel C. Kahane, Ph.D., for permission to reprint several photographs of dissections from his Merrill text, *Atlas of Speech & Hearing Anatomy*.

I am also indebted to Blaine Block, M.D., and Jerome Spiegel, M.D., for their professional support. Our dependence on one another's skills has provided a stimulating and positive environment, one in which I believe our patients have benefited. Others who have contributed so freely of their support and to whom I am deeply grateful include: Robert Pappard, M.A., for his clinical guidance; Kathy Grauvogel for her technical and personal support; Diane Tsivitse, M.A., for her editorial assistance; and the speech pathology staff of St. Elizabeth Medical Center in Dayton, Ohio, for their patience with me during the text preparation.

JOSEPH C. STEMPLE

*To My Family—
Words cannot express . . .*

Contents

1 Voice: A Historical Perspective 1

Ancient History, 2 The Renaissance, 5 The Seventeenth to
Nineteenth Centuries, 5 The Laryngoscope, 5 Modern History, 9

2 Anatomy and Physiology 13

Regional Anatomy, 13 Anatomy of the Larynx, 24 Physiology of the
Laryngeal Mechanism, 40 Theories of Phonation, 46

3 Some Etiological Correlates 55

Vocal Misuse, 55 Medically Related Etiologies, 59 Primary Disorder
Etiologies, 61 Personality-Related Etiologies, 62

4 Pathologies of the Laryngeal Mechanism 67

Incidence, 68 Organic Pathologies, 68 Functional Pathologies, 79

5 The Diagnostic Voice Evaluation 89

Patient Profile, 90 Referrals, 90 Professional Relationships, 91
Medical Examination, 92 The Voice Evaluation, 93 Additional
Considerations, 101 Sample Report, 103

6 Vocal Management 105

Management Strategies, 105 Management Strategies for Vocal Abuse,
106 Management Strategies for Inappropriate Vocal Properties,
117 Therapy Approaches, 117 Management Strategies for Medically
Related Etiologies, 135 Neurological Voice Disorders,
142 Management Strategies for Personality-Related Etiologies, 143

7 Comments On The Professional Voice 153

The Professional Voice User, 154 The "At-Risk" Status, 154 Common
Etiological Factors, 155 Common Pathologies, 160 Professional
Roles, 164

8 Commercial Instruments 169

Fundamental Frequency, 170 Intensity and Duration, 174
Fundamental Frequency, Intensity, and Duration, 180 Nasality, 184
Tension, 186 Patient Education, 189

9 Rehabilitation of the Laryngectomized Patient 193

Symptoms of Laryngeal Cancer, 193 Incidence of Laryngeal
Cancer, 194 Medical Evaluation, 194 Radiation Therapy, 195
Total Laryngectomy, 195 Rehabilitation Team, 196 Special Concerns
of the Laryngectomized Patient, 198 The Role of Speech Pathology, 205
Speech Rehabilitation, 211

Key to Vocal Samples

This book contains a plastic record of voice disorders.

SIDE 1

R 4-1 *Congenital Web: 11-year-old female*

Notice the high monotonous pitch.

R 4-2 *Bilateral Abductor Paralysis: 28-year-old female*

Notice the labored breathing and reduced pitch variability.

R 4-3 *Unilateral Adductor Paralysis: 62-year-old male*

Notice the loss of breath support. This patient tries to compensate by saying as much on one exhalation as possible. He quickly fatigues.

R 4-4 *Hyperkeratosis: 46-year-old female*

Notice the moderate dysphonia characterized by phonation and pitch breaks.

R 4-5 *Adductor Spastic Dysphonia: 60-year-old female*

Notice the aperiodic laryngeal spasms and imagine the whole-body tension produced as this patient attempts to speak.

In the second sample, the laryngospasms and tension have been eliminated following temporary paralysis of the left recurrent laryngeal nerve.

The third sample yields the post surgical voice which is similar to any other unilateral adductor paralysis.

Organic Essential Tremor: 65-year-old man

Notice that the tremor is more regular than the aperiodic laryngospasms of adductor spastic dysphonia. Seldom is there a total cessation of voice.

R 4-6 *Bilateral Vocal Fold Nodules: 12-year-old female*

Notice the mild to moderate dysphonia characterized by a dry hoarseness and breathiness.

viii

SIDE 2

R 4-7 *Unilateral Vocal Fold Polyp: 52-year-old female*

Notice the habitual glottal fry phonation and low pitch.

Polypoid Degeneration: 42-year-old female

Notice the low pitch and breathiness. The folds almost sound "flabby."

R 4-8 *Contact Ulcers: 32-year-old male*

Notice the low pitch, glottal fry phonation, and breathiness.

R 4-9 *Ventricular Phonation: 50-year-old male*

Notice the superior skill and apparent little effort with which the patient phonates with his ventricular vocal folds.

Ventricular Phonation: 35-year-old male

Notice the extreme effort it takes for this patient to phonate using his ventricular folds.

R 4-10 *Conversion Aphonia: 40-year-old female*

Notice that this is not a pure aphonia. This patient maintains minimal phonation but cannot increase her intensity level beyond this point.

Conversion Dysphonia: 26-year-old female

Notice the bizarre voice quality. Can you produce a voice that sounds like this patient? This patient honestly believed that this was the only voice she could produce.

R 4-11 *Functional Falsetto: 24-year-old male*

Notice the mild dysphonia and the flat resonant quality. Does it surprise you that the pitch is not higher?

R 4-12 *Juvenile Voice: 36-year-old female*

Notice the juvenile "little girl" quality of this voice. Does it surprise you that her voice fatigues easily?

R 9-1 *Intra-Oral Artificial Larynx*

Notice the effect of the intra-oral tube on articulation.

R 9-2 *Electronic Neck Type Artificial Larynx*

Notice the precise articulation and natural phrasing. This patient is easy to understand.

R 9-3 *Esophageal Voice*

Notice the short duration of phrases, the injection noise, and the stoma noise.

R 9-4 *Tracheo-esophageal Voice*

Notice the improved phrase duration, lack of stoma noise, and pitch inflection ability.

Chapter 1

Voice: A Historical Perspective



Voice, articulation, and language are the major elements of human speech production. When a disorder is present in any of these elements, the ability to communicate may be impaired. This text is concerned with voice and voice disorders. Voice is the element of speech that provides the speaker with the vibratory signal upon which speech is carried. Regarded as magical and mystical in ancient times, today the production of voice is viewed as a powerful communication tool. It serves as the melody of our speech and provides expression, feeling, intent, and mood to our articulated thoughts.

A voice disorder is said to exist when a person's quality, pitch, and loudness differ from those of other persons of similar age, sex, cultural background, and geographic locations (Aronson, 1980; Boone, 1977; Greene, 1972; and Moore, 1971). In other words, when the acoustic properties of voice are so deviant that they draw attention to the speaker, a voice disorder is said to be present. A voice disorder may also be present when the structure or function of the laryngeal mechanism or both aspects of it no longer meet the voicing requirements established for the mechanism by the owner of the voice. These requirements include vocal difficulties that are not readily recognized by others but are reported to be present by the voice owner. This point is important when we consider that successful management of a voice disorder is based on the individual's accepting the need for improvement. The effects of a voice disorder are relative to the voicing needs of each person. Those with a great need for normal voice production may be greatly concerned with the presence of even minor vocal difficulties. Those with low vocal needs may not be greatly concerned with even more severe vocal difficulties.

The speech pathologist plays a major role in the evaluation and management of voice disorders. This role focuses on two major goals: (a) evaluation and modification of specific deviant vocal properties, and (b) identification and modification or elimination of the causes that have led

to the development of the voice disorder (if the cause is still a precipitating factor). To accomplish these goals, the speech pathologist must have an extensive understanding of the normal anatomy and physiology of the laryngeal mechanism as well as knowledge of the common laryngeal pathologies. Etiological factors that lead to the development of voice disorders must also be understood as well as appropriate diagnostic techniques for discovering these causes. Finally, management approaches specific to the needs of each patient must be developed in order to improve the patient's laryngeal/vocal condition.

Only in the recent history of voice disorders have speech pathologists played this management role. Indeed, the first persons in the profession who became interested in the remedial aspects of voice did so about 50 years ago (Moore, 1977). The advent of voice therapy was a unique blend of the knowledge speech correctionists, as speech pathologists were then called, gained from training in the areas of public speaking, oral interpretation, and theater. This was followed by the development of their understanding in the areas of laryngeal anatomy, physiology, acoustics, psychology, and pathologies of the laryngeal mechanism. These years during which speech pathologists have dealt with the remediation of voice disorders represent only a minute amount of time when compared to the total history of the evaluation and treatment of voice disorders.

ANCIENT HISTORY

The earliest accounts of voice disorders, like all other medical information, were handed down orally. These accounts were mainly represented by folk remedies for various recognized disorders. Folklore remedies for disorders of the throat included liniment derived from centipedes, the juice of crabs, an owl's brain, and the ashes of a burned swallow. Plant remedies included cabbage, garlic, nettles, pennyroyal, and sorrel. The wearing of beads of various kinds or a black silk cord around the throat was also recommended. Last but not least was the excommunication of sore throats in the name of God (Stevenson & Guthrie, 1949).

One of the earliest written histories of a voice disorder was presented about 1600 B.C. in the Edwin Smith Papyrus. One of many Egyptian papyri discovered in burial tombs, the Edwin Smith Papyrus contained the earliest medical writings. It described 50 traumatic surgical cases beginning with injuries to the head and continuing down the body to the thorax. One of these cases was a detailed description of a crushing injury of the neck, which caused the loss of speech. The Egyptian writings contained a hieroglyph portraying the lungs and trachea (Figure 1-1). The larynx was not pictured, because no organ for voice had yet been identified (Fink, 1975).

The ancient Hindu civilization presented much medical information including mention of diseases of the throat. The most notable information

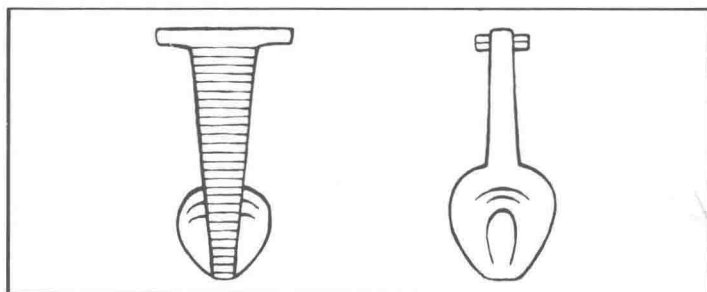


FIGURE 1-1 Egyptian hieroglyphs of the trachea and lungs.

was presented in the Sanskrit-Atharva-Veda (700 B.C.). Surgical achievements of the Hindus included tonsillectomy and rhinoplasty. Nose flaps became a necessity in this civilization, for cutting off the nose was the corporal punishment for adultery. Hindu gargles for throat disorders included oils, vinegar, honey, the juices of fruit, and the urine of sacred cows (Wright, 1941).

In the fifth century B.C., Hippocrates, the "Father of Medicine," was responsible for finally separating medicine from magic. One of Hippocrates' greatest contributions to medicine was his insistence upon the value of observation. Observation remains one of speech pathologists' most powerful diagnostic tools. Hippocrates made many observations regarding diseases associated with the throat and voice, although he, too, failed to mention the source of voice. Several of these observations, as translated by Chadwick and Mann (1950), include:

- Aphorism 58: Commotion of the brain, from any cause, is inevitably followed by loss of voice.
- Coan Prognosis 240: Aphonia is of the most serious significance if accompanied by weakness.
- Coan Prognosis 243: Aphonia during fever in the manner of that seen in a seizure, associated with a quiet delirium, is fatal.
- Coan Prognosis 252: A shrill whining voice and dimness of the eyes denote a spasm.

These examples demonstrate that Hippocrates studied symptoms more than treatments of diseases. Hippocrates was the first person to state that observation of voice quality, whether it be clear or hoarse, is one means by which a physical diagnosis may be reached (Chadwick & Mann, 1950). This certainly remains a powerful tool for use by speech pathologists today.

Aristotle was the first writer to refer to the larynx as the organ from which the voice emanates. In his *Historia Animalium*, written in the late fourth century B.C., he stated that the neck was the part of the body between the face and the trunk, with the front being the larynx and the back, the gullet. He further stated that phonation and respiration took place through the larynx and the windpipe (Fink, 1975).

This information lay dormant until five centuries later when the first true anatomist, Claudius Galenus, was born in Asia Minor in A.D. 131. Galen (Figure 1-2) derived his knowledge of anatomy from the dissection of animals. He greatly advanced the knowledge of the upper air passages and the larynx and described the warming and filtering functions of the nose. He also distinguished six pairs of intralaryngeal muscles and divided them into abductor and adductor muscles. The thyroid, cricoid, and arytenoid cartilages were described as well as the activity of the recurrent laryngeal nerves.

In experiments with pigs, Galen demonstrated that they would always cease squealing when the recurrent laryngeal nerve was cut. This led him to conclude that muscles move certain parts of the body on which breathing and voice depend and that these muscle movements are dependent on nerves from the brain. Galen, therefore, proved that the larynx was the instrument of voice, thus disproving the still popular belief that the "voice was sent forth by the heart" (Stevenson & Guthrie, 1949).



FIGURE 1-2 Claudius Galenus (Galen).

THE RENAISSANCE

Galen did much to further medical progress, but his theories and views, which were by no means totally accurate, were blindly accepted for 1,500 years as the world went through the Dark Ages. The Dark Ages was a historical period of intellectual and artistic stagnation that was finally broken in the late fourteenth and early fifteenth centuries A.D. with the invention of the printing press, the astronomical discoveries of Copernicus and Galileo, and the discovery of the western hemisphere. With these and other discoveries, the world began the great growth period known as the Renaissance.

A genius of the Renaissance, the bold artist Leonardo da Vinci (1452–1519) did not hesitate to exchange his painting brush for a dissection scalpel to explore the human anatomy. Andreas Vesalius (1514–1564) reformed the knowledge of anatomy (Figure 1–3). In his 1542 publication *De Humani Corporis Fabrica*, this 29-year-old anatomist and artist corrected many of the age-long errors of Galen. He clarified the laryngeal anatomy and presented the function of the epiglottis (Stevenson & Guthrie, 1949).

During this same time period, Bartolomeus Eustachias (1520–1574) (Figure 1–4) was one of the first people to describe the structure, course, and relations of the eustachian tube accurately. More interesting are his descriptions and carvings of the anatomy of the larynx, which were not discovered until the eighteenth century in the Vatican Library, and are even more detailed and accurate than those of Vesalius.

THE SEVENTEENTH TO NINETEENTH CENTURIES

The discoveries of anatomy, physiology, and pathology of the laryngeal mechanism continued, highlighted by descriptions of the laryngeal ventricles by Morgagni (1682–1771), further clarification of the purpose of the epiglottis by François Magendie (1783–1855) of Paris, the functions of the laryngeal cartilages and muscles in the production of voice by Robert Willis of Cambridge in 1829, and finally in Frederick Ryland's (1837) publication called *Treatise on the Disease and Injuries of the Larynx and Trachea*. This important publication clearly describes the diseases of the larynx (Figure 1–5) as they were understood before the invention of the laryngoscope.

THE LARYNGOSCOPE

The idea of examining the larynx in living humans had been in many minds since the time of Aristotle. It was not, however, until 1854 that a



FIGURE 1-3 Andreas Vesalius, 1514–1564.

Parisian singing teacher named Manoel Garcia (1804–1906) (Figure 1-6) made the discovery that ushered in the modern era of laryngology.

Strolling through the gardens of Palais-Royal on a bright September day, Garcia observed the flashing sun in the window panes of the quadrangle buildings.

Suddenly I saw the two mirrors of the laryngoscope in their respective positions, as if actually present before my eyes. I went straight to Charrière, the surgical instrument maker, and asking if he happened to possess a small mirror with a long handle, was informed that he had a little dentist's mirror, which had been one of the failures of the London exhibition of