Objective Procedures to Observe and Measure Vocal Fold Vibration

Essay submitted for partial fulfillment of the Master Degree in Phoniatrics

Presented by

Suzan Gamal Gouda

MB, B.Ch.

Under the supervision of

PROF. DR. MOHAMED NASER KOTBY

Professor and Chairman of Department of Otolaryngology and Phoniatric Unit

Faculty of Medicine-Ain Shams University

PROF. DR. MOHAMED ALI SAAD BARAKA

Professor of Phoniatrics

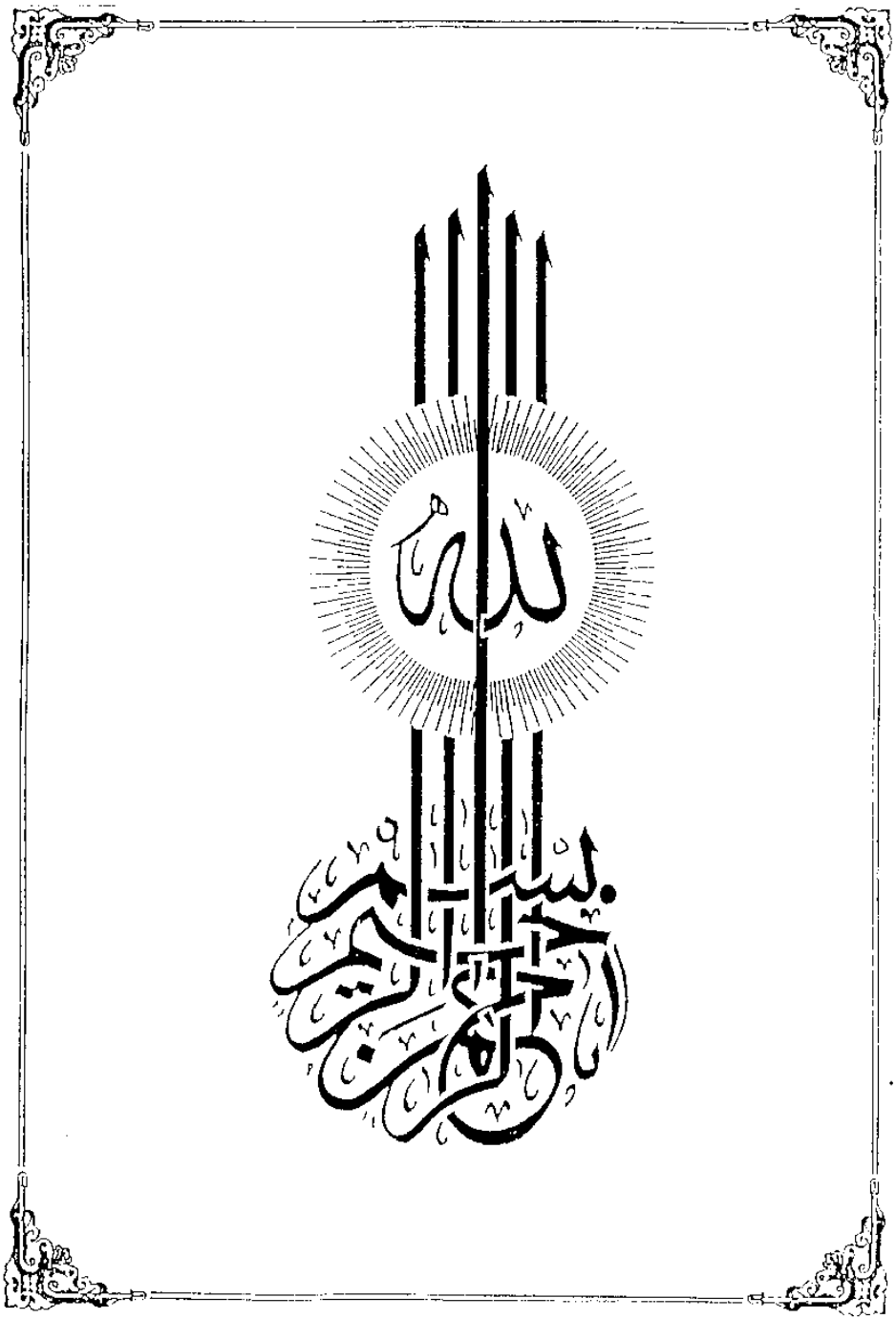
Faculty of Medicine-Ain Shams University

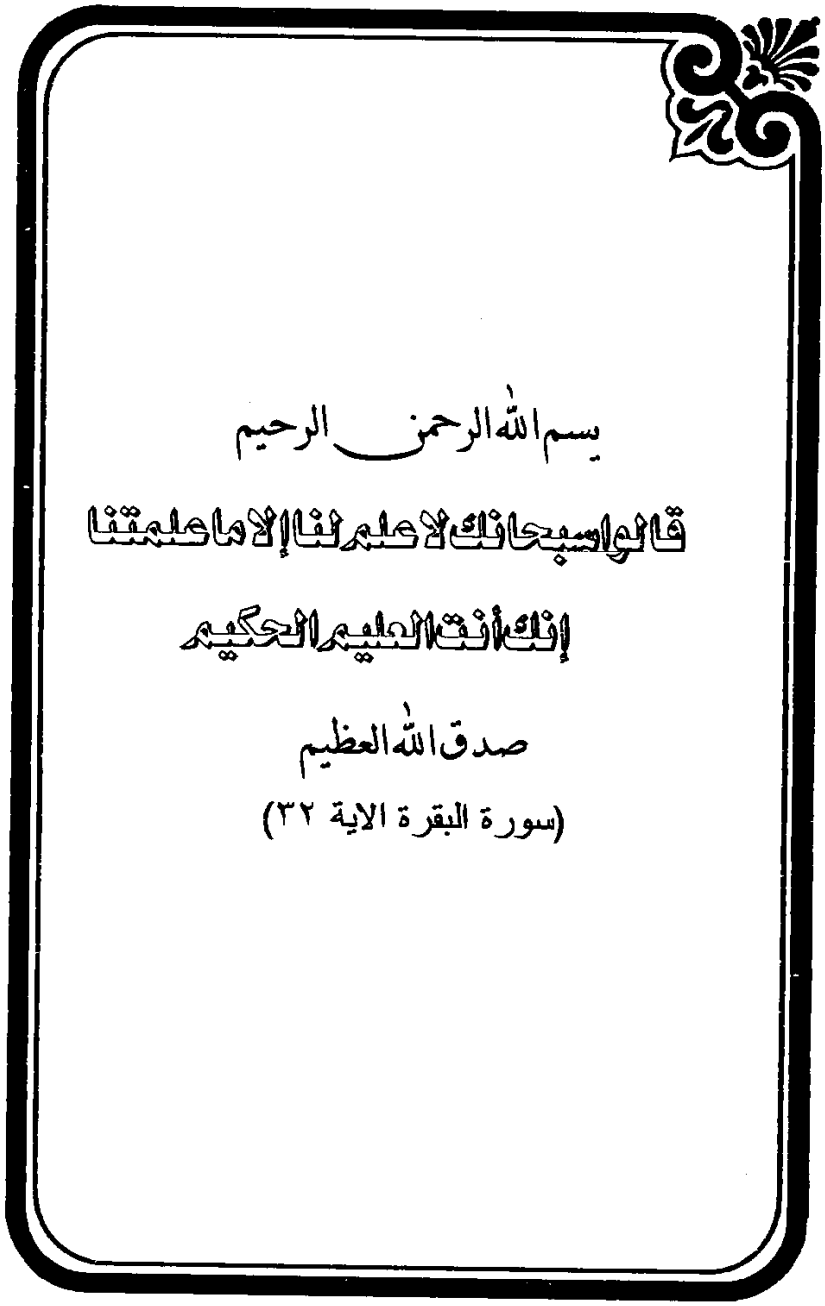
DR. SAMIA AL-SAYED BASSIOUNY

Assistant Professor of Phoniatrics

Faculty of Medicine-Ain Shams University

FACULTY OF MEDICINE
AIN SHAMS UNIVERSITY
1998





بسم الله الرحمن الرحيم

قالوا سبحانك لا علم لنا إلا ما علمتنا

إنك أنت العليم الحكيم

صدق الله العظيم

(سورة البقرة الاية ٣٢)

Acknowledgment

First of all, thanks to Allah, whose help is the main factor in accomplishing this work.

I would like to express my sincere thanks and highest appreciation to Professor, Dr. ***Mohammed Nasser Kotby,*** *Professor of Phoniatrics and Head of the Department of Otolaryngology, Ain Shams University for allowing me the benefit of his past experience, for his advice, his patience throughout the work. Really, he gave me the honor by being my supervisor in achieving this work.*

Words stand short when coming to express my deepest thanks and appreciation to Professor, Dr. ***Mohammed Ali Barakah,*** *Professor of Phoniatrics, Ain Shams University for giving me his help and support which have been of great value in the course of this work.*

My sincere thanks to Assistant Professor Dr. ***Samia Bassiouny,*** *for her advice and her enthusiastic supervision during this work.*

Last but not least, I would like to thank all my colleagues for their valuable support and assistance.

Suzan Gamal
1998

List of Contents

Introduction and Aim of the Work

Introduction

Voice and speech are essentially an aerodynamic phenomenon. In this respect, the glottis represents the reed of a wind instrument where aerodynamic power is changed into acoustic power ***(Kotby et al., 1989)***. The displacement of the vocal fold by aeromechanical forces results in transient distortions in vocal fold shape that vary in character along the vocal fold and occur at different times within a vibratory cycle. Although greatly influenced by subglottic pressure, these redistribution of vocal fold volume are highly dependent on the physical properties of the vocal fold and on mechanical stress created by intrinsic laryngeal muscle activity ***(Kahane, 1986)***.

In reviewing the objective measures available for voice assessment, it is evident that no one measure can be expected to provide a diagnosis of a specific laryngeal disease. This is not surprising in view of the complexity of the mechanism of voice production.

Indeed, it may be difficult to detect early disease because of the wide range of normalcy and the overlap between normal and slightly abnormal measurements. Recently the development of non-invasive, multi-dimensional tools has made the diagnosis of vocal fold pathology possible. With technologic advance, a more

complete answer is present with the use of complementary tests for different aspects of laryngeal function coupled with a good history and physical examination ***(Martin, 1993).***

Vocal assessment should permit us to categorize the pathology etiologically, to assess its degree, to choose the type and sequence of intervention, to draw prognostic anticipation, and to understand the nature of the pathology ***(Kotby, 1986).*** Also, the study of the vibratory patterns of the vocal fold helps to plan new phonosurgical techniques ***(Salvit and MacCaffery, 1995).***

There is often a large discrepancy between subjective complaints and objective findings in dysphonic patients. Many patients have perceptually dysphonic voices but lack visible pathology by mirror examination. Visualization of vocal fold vibratory function may reveal evidence to explain the abnormal acoustic manifestations. Direct observation of the complex vibratory patterns of the vocal folds during phonation offers the clinician one of the best indication of laryngeal function ***(Woo, 1996).*** Because vocal fold oscillations occur at rates of 100 to 250 Hz during normal phonation or even at 1000 Hz or more during singing ***(Von Leden, 1976),*** special methods are necessary to facilitate the observation of vocal fold vibration. Some of them are direct such as stroboscopy, high speed photography (cinematography),

videokymography, while others are indirect such as ultrasonography, electroglottography and inverse filtering.

Each method has its advantages and disadvantages and its mechanism for studying the secrets of vocal fold vibration.

Aim of the Study

To review the literature concerning methods used to observe and measure the vocal fold vibrations, in order to outline the most efficient, effective and clinically suitable method that assesses comprehensively the vocal fold function at both normal and pathological conditions.