# Validity of Some Diagnostic Procedures of Velopharyngeal Valve Incompetence

*Thesis*
**Submitted in Partial Fulfillment for M.D in Phoniatrics**



*By*
**Emad kamel Abdel Haleem**
*M.Sc Phoniatrics*

*Supervised by*

**Prof. Dr. Mohamed Nasser Kotby**

*Chairman of the Unit of Phonitarics*

**Prof. Dr. Ikram Ebrahim Safe**

*Professor of Plastic Surgery*



Faculty of Medicine
Ain Shams University

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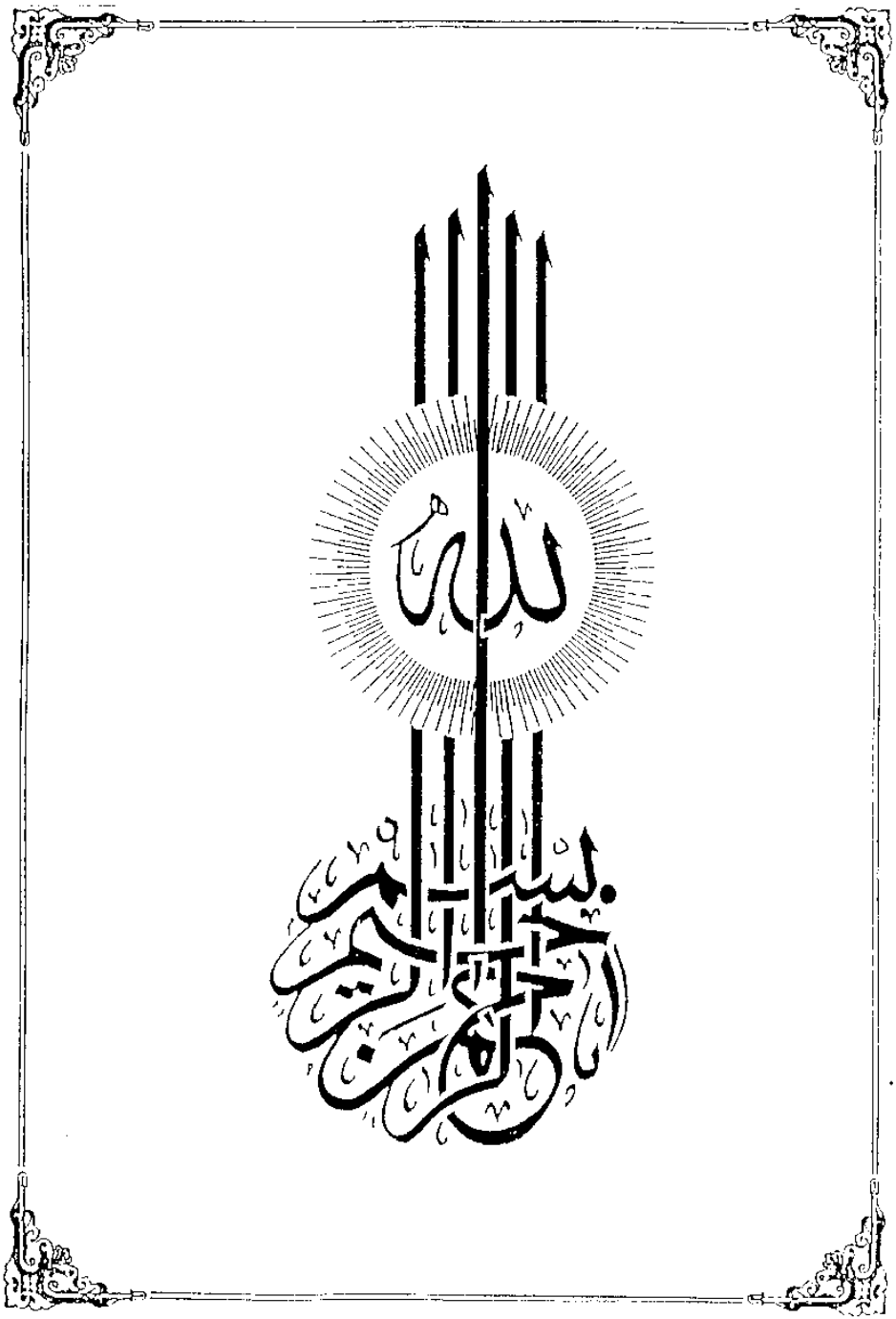
بسم الله الرحمن الرحيم

سبحانك لا علم لنا إلا ما علمتنا إنك أنت العليم الحكيم

صدق الله العظيم




To my sincere,

Hanaan.....

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Thanks,god.....

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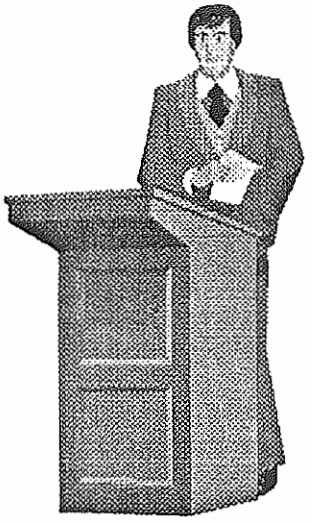


# Introduction and Aim of the Work

# INTRODUCTION

Velopharyngeal incompetence is one of the frequent communicative disorders (Hirschburg,1986). Its effect is not only disturbed swallowing,but mainly disruption of speech and deterioration of the communicative ability (Kotby,1981).

Velopharyngeal (vp) insufficiency affects speech by several means,mainly causing:

1-Hypernasality.

2-Imprecision of consonant articulation.

3-Audible nasal emission of air.

4-Faulty compensatory articulatory mechanisms.

Speech quality is recognized as the essential criterion for assessing the ultimate results of treatment for children born with clefts of the palate,the commonest cause of vp insufficiency (Fletcher,1970). In spite of this fact,the precision with which speech and the underlying oral function may be assessed has developed rather slowly. The main limitation in progress was essentially due to the fact that all diagnostic and remedial approaches have depended upon perceptual evaluation as the bases for clinical judgements (Fletcher,1970). This approach has at least two major limitations:

First,the standard baselines against which judgements are met are unstable and thus rather undependable for repeated comparisons over time,or among different clients. Second,the process of sharing information among clinicians is hampered by the vagueness with which the basic parameters of the disability are defined

(Fletcher,1970).

Kotby (1981) stated that the main problem that faces the treating team is the difficulty in correlating the communicative ability of the subject to the degree of structural incompetence of the vp port. What makes the problem even more difficult is the unreliability of the subjective means for the evaluation of the communicative behaviours of the patient.

The rapid evolution of the electronic technology has made biomeasurement procedures feasible for precise,quantitative and reliable measurements (Fletcher,1970). Meanwhile,several attempts have been made to transform the evaluation of the communicative ability of the patient to an objective or at least quasiobjective measures (Kotby,1981).

Horii and Lang (1981) stated that criteria for a recommended or perfect method of evaluation of vp valve function must:

1)Be reliable and valid.

2)Be capable of analyzing connected speech as well as isolated sustained production of speech sounds.

3)Interfere as little as possible with the normal process of respiration,phonation,articulation and with auditory,tactile and kinaesthetic feedback.

4)Be physically and psychologically non-invasive or essentially so.

Accordingly,many objective techniques have been devised and used to overcome the problem of assessing velopharyngeal function in speech,both in normal and pathological conditions. The following domains have witnessed significant development:

a)Technological advances in radiology have moved from

cephalometrics and tomography (Kuen and Dolan,1975) to cine- (Moll,1960; Williams and Eisenbach,1981; Henningsson and Isgerg,1986; Moon and Smith,1987; Henningsson and Isberg,1991 a) and videofluroscopy (McWillims and Girdany,1964; Cohn et al.,1984; Isberg and Henningsson,1990),and from lateral, extended and frontal views of the mechanism to the base view added by Skolnick(1970). C.T.Scan was also tried (Honjo et al., 1984).

b) Endoscopy has evoluted from the panendoscope (Taub,1966) to sophisticated endoscopes often coupled to videotape equipment (Matsuya et al.,1974; Miazaki et al.,1975; Pigott,1980; Ibuki et al.,1981; Siegel-Sadewitz,1982; Ibuki et al.,1983; Karnell et al.,1983; Riski et al.,1989; Witzel and Posnick,1989; D'Antonio et al.,1989; Golding-Kushner,1990; Henningsson and Isberg,1991b; Mazzola et al.,1992; Covello et al.,1992; Ysunza and Vazquez,1993).

c) Various aeromechanical devices have also been developed to measure nasal and oral pressures,to estimate the size of velopharyngeal openings and to measure nasal airway resistance (Hixon et al.,1967; Warren and DuBois,1964; Subtelny et al.,1970; Warren,1979; Dalston and Warren,1986; Laine et al.,1988 a and b; Dalston et al.,1991).

d) Acoustic measures that correlate with percieved hypernasality have also been developed,tested,and used clinically

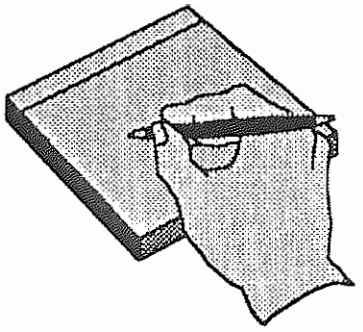
have also been developed,tested,and used clinically (Fletcher,1970; Stevens et al.,1975; Fletcher,1976; Dalston and Warren,1986; Haapanen,1991 a and b; Dalston et al.,1991; Seaver et al.,1991; Hardin et al.,1992; Dalston and Seaver,1992; Nellis et al.,1992).

e) Electromyography has provided basic information about muscle activity during speech. The behaviour of individual muscles and their dynamic interactions have helped to explain the movements observed by videofluoroscopy and endoscopy and to illuminate the sequence of events within the motor patterns (Lubker,1968; Fritzell,1969; Harris,1970; Seaver and Kuehn,1980).

Other methods for evaluation of velopharyngeal mechanism with little use have been developed such as accelrometry (Stevens et al.,1975) and phototransduction (Dalston,1982). In spite of such major development, a universally accepted and standerdized clinical protocol of assessment of vp port function is not available.

## AIM OF THE WORK

The purpose of this work is to evaluate the validity of some diagnostic procedures for velopharyngeal port function as a preliminary step in the development of a protocol for the quasi-objective assessment of patients with velopharyngeal valve insufficiency. This protocol is designed for the proper initial assessment of the condition and to help guide the type and sequence of intervention and monitor its effects. The latter two goals are of particular importance in problematic cases requiring secondary intervention.



# Review of literature

## MECHANISM OF VELOPHARYNGEAL VALVING

The palate (both hard and soft) separates the nasal and oral cavities. It's primary biological function is to keep everything but air away from the nasal pathways, the delicate respiratory and sensory epithelium of which must be protected from various noxious agents such as foods and drinks. Situated at the cross - roads of the upper respiratory and elementary tracts, the soft palate or velum plays a very important role in fulfilling this function. It acts like a valve, closing off the nasal cavities and nasal part of pharynx during deglutition. In man another important function has been added to this primary biological one. The soft palate participates in the production of articulate speech.

It is generally accepted that there are differences in vp function for speech and non-speech activities (Hirschburg, 1986). Non-speech tasks involve the more reflex activities such as swallowing, gagging, yawning, blowing and sucking and it appears that vp function for such reflex activities is more extensive and more gross than that for speech activities. In the course of swallowing the pharyngeal constrictors have a greater role in the vp closure mechanism than in speech (Bauer, 1966) and moreover the mesial movement of the lateral pharyngeal wall is more marked during swallowing than during phonation (Isshiki et al., 1969). The difference between the function of swallowing and that of phonation also appears in that the velar contact to the posterior pharyngeal wall in swallowing occurs much lower (caudal) in the

pharynx than such activity for speech (Lavorato and Lindholm, 1977; Walter,1981) and that vp movement in speech is much more rapid (Morris,1966).

Closure of velopharyngeal port during phonation:

The closure of the vp portal during phonation is the result of two types of motion:the elevation and backward movement of the soft palate to secure contact with the posterior pharyngeal wall;this valve-like action is the main component of the closure mechanism. The medial movement of localized regions of both lateral walls against the palate also contributes to this closure. This constictive action of the port is probably mediated by upper fibers of the superior constrictor muscle, although levator muscle action may also be important. It has been speculated that both velar and lateral pharyngeal motion during closure for speech could be a function solely of the levator palatini (Cotton and Nuwayhid,1983), Figure (1). The forward bulging of the posterior pharyngeal wall in the form of (Passavant's ridge) does not seem to occur or to be of importance in normal speakers (Fritzell,1976.)

While opinions concerning the function of the posterior pharyngeal wall vary, it is generally accepted that the inward movement of the lateral wall considerably contributes to the production of the vp closure (Honjo et al., 1976; Cotton and Quattromani,1977; Walter,1981). This motion in normal subjects usually amounts to several millimeters (Skolnick,1969), but varies considerably among individuals (Shprintzen et al.,1979). It is important to recognize that the level of miximal lateral