



Systemic Disorders Affecting Voice

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List of Abbreviations

Ach	: Acetylcholine
AIDS	: Acquired immune deficiency syndrome
ALS	: Amyotrophic lateral sclerosis
ATP	: Adenosine triphosphate
ATP7B	: Adenosine triphosphatase metal-transporting P-type
CAJ	: Cricothyroid joint
CNS	: Central nervous system
COPD	: Chronic obstructive pulmonary disease
CRF	: Chronic renal failure
CSF	: Cerebrospinal fluid
DM	: Diabetes mellitus
DNA	: Deoxyribonucleic acid
EMG	: Electromyography
GERD	: Gastroesophageal reflux disease
GHD	: Growth hormone deficiency
HD	: Huntington's disease
HIB	: Haemophilus influenzae type B
ICSs	: Inhaled corticosteroids
IgG HIV	: Immunoglobulin G of Human immunodeficiency virus
IgM HIV	: Immunoglobulin M of Human immunodeficiency virus
LTB	: Laryngo tracheo bronchitis
MG	: Myasthenia gravis
MRI	: Magnetic resonance imaging
MS	: Multiple sclerosis
NSAIDs	: Non-steroidal anti-inflammatory drugs
OTC	: Over-the-counter
PCOS	: Polycystic ovarian disease
PPD	: Purified protein derivative
PTL	: Pulmonary tuberculosis
RA	: Rheumatoid arthritis
RLN	: Recurrent laryngeal nerve

List of Abbreviations

RT	:	Radiotherapy
SLE	:	Systemic lupus erythromatosis
SLN	:	Superior laryngeal nerve
TB	:	Tuberculosis
TH	:	Thyroid hormone
TSH	:	Thyroid stimulating hormone
VCR	:	Vincristine
WD	:	Wilson's disease
WG	:	Wegner's granulomatosis

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Introduction

Voice is a complex, dynamic product of vocal fold vibration that allows us to vocalize (i.e. make sound) and verbalize (i.e. produce language through speech) (**Justice, 2009**). The basic task of the voice is to act as a carrier wave of speech communication (**Vilkman, 2000**). Control of voice is essential component in the individual's ability to adjust the social situation, to make good contact and maintain equilibrium in relation to the audience (**Greene & Mathieson, 2001**).

Although most of voice problems are not life threatening conditions, they have significant impacts on the occupational, social, psychological, physical and communicative areas of dysphonic individual (**Ghandour et al., 2013**).

To produce sounds in speaking or singing four elements are involved respiration, phonation, articulation and resonance. A disruption due to general medical condition of any of these may result in abnormalities of speech or sound production (**Hasbrouk & Kenevan, 1991**).

Prerequisites of normal voice production are:

1. Normal range of movement of vocal folds.
2. Normal mobility of the mucosa on the deep layers.
3. Optimal coaptation of vocal folds edges.
4. Optimal motor force.
5. Optimal pulmonary support.
6. Optimal timing between vocal fold closure and pulmonary exhalation.
7. Optimal timing of vocal fold musculature(internal and external).

There is evidence from both clinical and research setting that systemic diseases may also affect larynx

& voice production (*Stemple et al., 2000*). Controlling these diseases help to improve voice quality (*Colton et al., 2006*).

Systemic diseases affecting voice include:

A. Endocrine disorders include:

Thyroid gland disorders, anterior pituitary disorder, gonadal disorders, parathyroid glands disorder, adrenal glands disorder and diabetes mellitus.

B. Immunologic disorders:

Rheumatoid arthritis, Systemic Lupus Erythematosus (SLE), sarcoidosis, Wegener's Granulomatosis, Scleroderma, Sjögren's Syndrome and relapsing polychondritis.

C. Neurological disorders:

The neurological disorders of the larynx are classified according to site of affection to:

1. Upper motor neuron lesion involving either:

The pyramidal system, extra pyramidal system or cerebellum (*Kotby, 1995*).

2. Lower motor neuron lesion involving either:

Brain stem nuclei, Peripheral laryngeal nerves, Neuromuscular junctions or laryngeal muscles (*Kotby, 1995*).

D. Respiratory disorders:

1. Chronic obstructive pulmonary disease (COPD) and bronchial asthma.
2. Respiratory Tract infections can cause voice disorders, Rhinitis, sinusitis, laryngitis and pharyngitis are known

to inflame the mucosa and this could cause habitual clearing of the throat(*Thomas et al., 2006*).

E. Pharmacological & Radiological:

Almost all medications have some potential effect on voice (*Spiegel et al., 2005*).

F. Metabolic diseases:

Gout, Wilson's disease, Xanthomatosis ,Amyloidosis and lipoid proteinosis.

G. Chronic renal failure.

Aim of the Work

To review the different systemic disease that affect the degree and nature of voice in order to help us to determine the effective methods of assessment and management of these voice disorders and to prevent their negative impact on patients life.

Anatomy of the Larynx

Anatomic orientations are used to help professionals communicate and provide landmarks for classifications and descriptions of various diseases (*Joy et al., 2006*).

Larynx is composed of Cartilages connected by ligaments and moved by muscles. The larynx is a 5-7 cm long structure. Its upper boundary starts at the tip of the epiglottis (the black arrow), opposite the 3rd to 4th cervical vertebra. The lower end is at the lower border of the cricoid cartilage (the white arrow), lies opposite the 6th cervical vertebra.



Fig. (1): MRI sagittal section showing the larynx (*Joy et al., 2006*).

Laryngeal Cartilages:

The structural rigidity of the larynx is provided by:

The three median (unpaired) cartilages:

The epiglottis, Thyroid cartilage and Cricoid cartilage.

Also 3 paired cartilages:

Arytenoid, Corniculate and Cuneiform, along with the hyoid bone (*Armstrong and Netterville, 1995*).

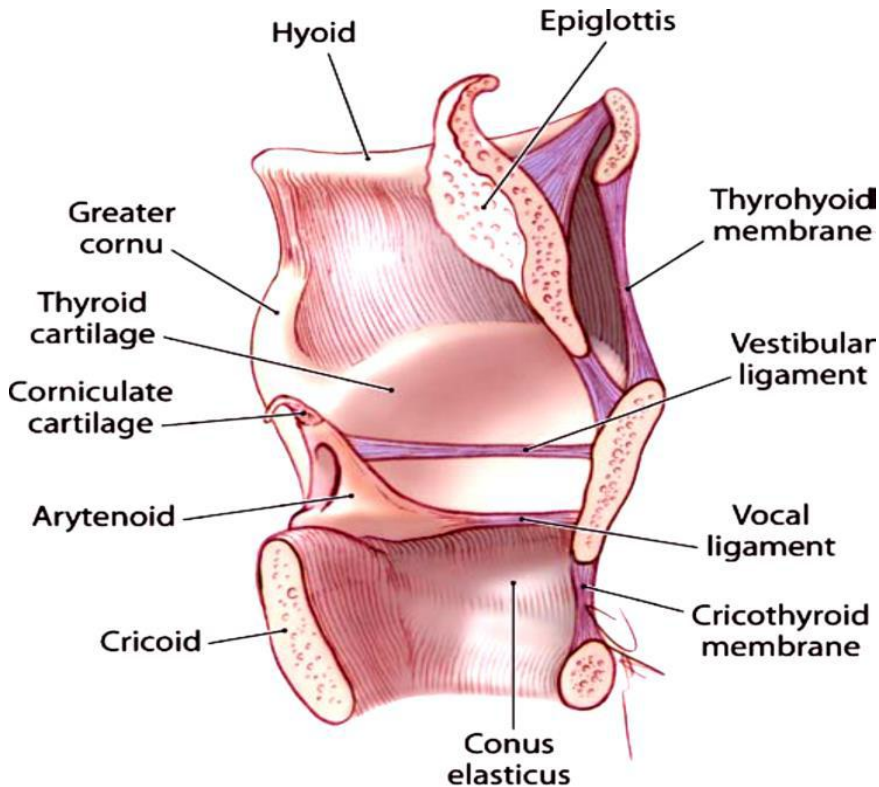


Fig. (2): Cartilaginous and fibroelastic structures of the larynx (*Platzer, 1989*).

1-Thyroid cartilage:

The largest cartilage. The thyroid cartilage is composed of two rectangular laminae that are fused anteriorly in the midline. The incomplete fusion of the two laminae superiorly forms the thyroid notch. Attached to each lamina posteriorly are the superior and inferior cornua. The superior cornua articulate with the greater horns of the

hyoid bone, while the inferior cornua form a synovial joint with the cricoid cartilage (the cricothyroid joint) (*Armstrong and Netterville, 1995*).

2-Cricoid cartilage:

This signet ring-shaped cartilage is the only laryngeal cartilage to encircle completely the airway. The cricoids cartilage articulates with the thyroid cartilage's inferior cornua on the cricothyroid joint facets. It joins the first tracheal ring inferiorly via membranous attachments (*Armstrong and Netterville, 1995*).

3-Epiglottis:

The epiglottis is an oblong, feather-shaped fibroelastic cartilage that is attached, at its inferior end, to the inner surface of the thyroid cartilage laminae just above the anterior commissure. The major function of the epiglottis is to help prevent aspiration during swallowing (*Armstrong and Netterville, 1995*).

4-Arytenoids:

The arytenoid cartilages are paired, pyramidal cartilages that articulate with the posterior lamina of the cricoids cartilage at the cricoarytenoid joint. Each arytenoid has both a vocal process medially and a muscular process laterally. These processes act as the attachment sites for the vocal ligament and the major intrinsic muscles of vocal fold movement respectively (*Armstrong and Netterville, 1995*).

5-Cuneiform and corniculate:

The cuneiform cartilages are crico-arytenoid joint paired elastic cartilages that sit on top of, and move with,