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وعنوانها:

تقييم البلع فى مرضى الإستئصال الجزئى للحنجرة من خلال الفحص بأشعة الباريوم المصورة بالفيديو (الفيديوفلوروسكوبى)

VIDEOFLUOROSCOPY ASSESSMENT OF SWALLOWING AFTER PARTIAL LARYNGECTOMIES

تحت إشراف

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VIDEOFLUOROSCOPY ASSESSMENT OF SWALLOWING AFTER PARTIAL LARYNGECTOMIES

Thesis

Submitted for Partial Fulfillment of M.D. Degree in Otorhinolaryngology

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رسالة

توطئة للحصول علي درجة الدكتوراه
في جراحة الأنف والأذن والحنجرة

مقدمة من
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List of Contents

List of Abbreviations

AC:	: Anterior commissure
C-A	: Cricoarytenoid
CAU	: Cricoarytenoid unit
CHEP	: Cricohyoidoepiglottopexy
CHP	: Cricohyoidopexy
EL	: Extended partial laryngectomy
FEES	: Flexible endoscopic examination of swallowing
FEESST	: Flexible endoscopic examination of swallowing with sensory testing
FEV1	: Forced expiratory volume in 1 second
FLHL	: Frontolateral hemilaryngectomy
FLVPL	: Frontolateral vertical partial laryngectomy
FVC	: Forced vital capacity
HSL	: Horizontal supraglottic laryngectomy
IBSLN	: Internal branch of the superior laryngeal nerve
LAR	: Laryngeal adductor reflex
LCA	: Lateral cricoarytenoid
MBS	: Modified Barium Swallow
ND	: Neck dissection
NTL	: Near-total laryngectomy
NGT	: Nasogastric tube
OSGL	: Open supraglottic laryngectomy
PAS	: Penetration aspiration score
PEG	: Percutaneous Endoscopic Gastrostomy.
PES	: Preepiglottic space
RCT	: Radio-chemotherapy
RLN	: Recurrent laryngeal nerve
SCPL	: Supracricoid partial laryngectomy
SLN	: Superior laryngeal nerve
SGPL	: Supraglottic partial laryngectomy
TEP	: Tracheoesophageal prosthesis
TLM	: Transoral laser microsurgery
UES	: Upper Esophageal Sphincter
VFSS	: Videofluroscopy Swallowing Study
VHL	: Vertical hemilaryngectomy
VPL	: Vertical partial laryngectomy
VF	: Vocal fold

INTRODUCTION

Treatment of laryngeal cancer has undergone fundamental changes in the past few decades due to improvements in surgical techniques and radiotherapy. The standard treatment by total laryngectomy has increasingly been replaced by organ preservation modalities or function-conserving resection techniques including; horizontal partial laryngectomy (as supraglottic laryngectomy, supracricoid laryngectomy), Vertical partial laryngectomy and Laser cordectomy. With these treatment techniques, however, complications, mainly, Dysphagia and aspiration are frequent ***(Laccourreye et al, 1991; Weissler, 1994; Kronenberger and Meyers, 1994).***

Aspiration can reach up to 86% in partial vertical laryngectomy, up to 97% in partial horizontal laryngectomy and up to 100% in subtotal laryngectomy **(KREUZER et al, 2000).**

Aspiration pneumonia is a common fatal complication after partial laryngeal surgery (reaching up to 21.2% in extended supraglottic laryngectomy and up to 11.5% in supracricoid partial laryngectomy) and in some cases total laryngectomy may be required ***(Suarez et al, 1996; Naudo et al, 1997 andProgmet et al, 2002).***

The need for total laryngectomy for intractable aspiration after supracricoid laryngectomy with cricohyoidoepiglottopexy ranges from 0% to 4%, while after supraglottic laryngectomy it ranges from 0% to 5% ***(Laccourreye et al, 1990).***

Even minor aspiration can be detected by postoperative Videofluoroscopy which is a radiological examination method by which functional disorders in swallowing and structural changes can be examined after partial laryngeal surgery ***(Balfe, 1990 and Peretti et al, 2006).***

Although swallowing disorders in post partial laryngeal patients are frequently reported, the exact extent to which laryngeal resection and reconstruction techniques are related to dysphagia or aspiration are not completely understood. Which types of resection are more related to post operative dysphagia, which anatomical or functional parts of the larynx are essential for trouble free swallowing and which reconstruction techniques offer better functional results are questions that remain to be accurately answered.

AIM OF THE WORK

The aim of this work is to detect and analyze postoperative dysphagia and aspiration by videofluoroscopy in relation to different types of partial laryngeal surgeries for cancer larynx and to detect the efficacy of certain swallowing therapy procedures in decreasing postoperative dysphagia and aspiration.

APPLIED CLINICAL ANATOMY AND PATHOLOGY OF THE LARYNX

A) Laryngeal Cartilages

1-Thyroid Cartilage

It is the largest cartilage of the larynx and is composed of two alae. The alae are fused in the midline and open posteriorly. In the male, the alae fuse at about 90 degrees, making a laryngeal prominence or Adam's apple. In female, this prominence is absent owing to the more oblique fusion angle of 120 degrees. Superiorly, the fusion of the alae is deficient, accounting for the thyroid notch. Posteriorly, each ala has a superior and inferior horn or cornu. The inferior cornu articulates with a facet on the cricoid cartilage to form the cricothyroid joint. The superior cornu attaches to the greater cornu of the hyoid bone by the lateral thyrohyoid ligament ***(Hast, 1993).***

The two lateral thyrohyoid ligaments, along with the median thyrohyoid ligament, are condensations of the thyrohyoid membrane; these structures attach the hyoid bone to the thyroid cartilage. At the attachment of the superior cornu to the alae of the thyroid, a protuberance called the superior tubercle is found. About 1 cm anterior and superior to this tubercle, the superior laryngeal artery and the internal branch of the superior laryngeal nerve and associated lymphatic's pierce the membrane to supply the supraglottic larynx. At this point, transcutaneous anesthesia of the internal branch can be performed ***(Sasaki et al., 1996).***

Understanding the relationship between the levels of the true cords in relation to the thyroid cartilage is crucial to performing supraglottic laryngectomy and phonosurgery (thyroplasty type I). In this regard, the midline vertical distance from the thyroid notch to the inferior border of the thyroid cartilage ranges from 20 to 47 mm in men and 15.5 to 38 mm in women. The anterior commissure is found at the midpoint between these landmarks. The posterior extent of the cords is anterior to the oblique line and true cords occupies the middle third of this line ***(Maue and Dickinson, 1971).***

The thyroid cartilage is lined by a thick layer of perichondrium on all surfaces except the inner surface at the anterior commissure. At this point are attached five ligaments, which form the scaffolding for the corresponding laryngeal folds. From superior to inferior, they are the median thyroepiglottic ligament, bilateral vestibular ligaments, and bilateral vocal ligaments.The attachment of these ligaments penetrates the inner perichondrium, forming Broyle's ligament. This ligament contains blood vessels and lymphatics and constitutes an important barrier to the spread of laryngeal neoplasms ***(Meiteles et al., 1992).***

It was postulated that, the invasion of cancer into the thyroid cartilage occur more easily in areas of cartilage ossification, commonly at the angle. Other sites of predilection are the points of attachment of the cricothyroid membrane and the anterior origin of the thyroarytenoid musculature. The perichondrium provides an excellent barrier to invasion, and once the carcinoma is within the cartilage, the cancer can extend throughout the cartilage behind an

intact perichondrium, precluding clean surgical cuts through the cartilage during partial laryngectomy ***(Yeager and Archer, 1982 and Lam, 1983).***

A large proportion of patients staged clinically as T3 glottic carcinoma have thyroid cartilage invasion. In these patients, any combination of two factors including significant degree of calcification of the cartilage, tumor length greater than 2 cm, and anterior commissure involvement resulted in a higher incidence of cartilage invasion (71% to 92%) ***(Kirchner, 1984 and Nakayama and Brandenburg, 1993).***

Hartl et al. (2010) mentioned that lesions involving the anterior commissure did not invade the thyroid cartilage more frequently than tumors not involving the AC. So the decreased local control in T3 glottic carcinoma with AC involvement and minor thyroid cartilage invasion is attributed to preepiglottic and paraglottic space invasion.

2- Cricoid Cartilage

The cricoid cartilage is the only circumferential ring in the airway, with the anterior arch measuring 3 to 7 mm in height and the posterior lamina about 20 to 30 mm in height and preservation or reconstruction of its ring-shaped structure allows for decannulation after conservation laryngeal surgery ***(Welsh et al., 1983 and Hast, 1993).***

Its inferior border is attached to the first tracheal cartilage by the cricotracheal ligament. On the posterior surface of the cricoid, the posterior cricoarytenoid muscles are attached in depressions, which are separated by a midline vertical ridge.

These muscles are the only abductors of the vocal folds. Housed on the superior surface of the posterior cricoid lamina are the paired arytenoid cartilages.

In the midline, between the superior portion of the arch and the inferior border of the thyroid cartilage, is the cricothyroid membrane ***(Sasaki et al., 1996).***

The most common site of cricoid cartilage invasion by carcinoma is at its posterior superior border, and the most common site of arytenoid invasion is at the points of attachment of the joint capsule ***(Welsh et al., 1983).***

3- Arytenoid Cartilages

The arytenoids are paired cartilages that articulate with the posterosuperior portion of the cricoid cartilage. Each arytenoid is pyramidal in shape, giving it a base, an apex, and three sides. The base provides the articular facet as well as the muscular and vocal processes. Laterally, the base forms a broad muscular process, and anteriorly, it forms the thinner vocal process. The anterior surface receives the vestibular ligament as well as the thyroarytenoid and vocalis muscles (the most medial fibres of thyroarytenoid muscle). The posterior surface receives muscular attachments. Sitting at the apex of the arytenoid is the corniculate cartilage ***(Hast, 1993 and Sasaki et al., 1996).***

4- Corniculate and Cuneiform Cartilages

These are small, paired fibroelastic cartilages. The corniculate, or cartilage of Santorini, is housed on the apex of the arytenoid cartilage. The cuneiform, or cartilage of Wrisberg, when