

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

﴿قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا

عَلَّمْتَنَا إِنَّكَ أَنْتَ الْعَلِيمُ الْحَكِيمُ﴾

صدق الله العظيم

سورة البقرة : آية ٣٢

PHARYNGO-CUTANEOUS FISTULA AFTER LARYNGECTOMY PREDISPOSING FACTORS AND MANAGEMENT

A thesis submitted for fulfillment of
Master Degree in surgical oncology

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2010

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رسالة مقدمة توطئة للحصول علي درجة الماجستير في جراحة الأورام

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Acknowledgements

First and for most, I feel indebted to ALLAH, most graceful, who gave me the strength to complete this work.

I would like to express my deepest gratitude and appreciation to my principal supervisor, Prof. Dr. Mohamed Mohamed Safa, Professor of surgical oncology, national cancer institute , Cairo University, for his generous support, encouragement, helpful suggestions and continuous supervision throughout the research, and for his precious time and effort that made this essay possible.

I am particularly grateful to Assistant Dr. Hamdy Hamed Ibrahim El-Marakby Assistant Professor of surgical oncology, national cancer institute, Cairo University, for his valuable foresight and meticulous supervision of this work.

Words are few and do fail to express my deepest gratitude to Dr. Ashraf Hamed Ibrahim Lecturer of surgical oncology, national cancer institute, Cairo University, for his continuous encouragement, and close supervision throughout the course of this work.

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Abbreviations

Abbreviations

C4	Cervical vertebra number 4
C5	Cervical vertebra number 5
CN X	Cranial nerve number 10 (vagus)
HPV	Human papilloma virus
VC	Verrucous carcinoma
BSCC	Basaloid squamous cell carcinoma
PSCC	Papillary squamous cell carcinoma
ASCC	Adenosquamous cell carcinoma
WDNEC	Well-differentiated neuroendocrine carcinomas
MDNEC	Moderately differentiated neuroendocrine carcinomas
PDNEC	Poorly differentiated neuroendocrine carcinomas
FFL	Flexible fiber-optic laryngoscopy
PET	Positron emission tomography.
VPL	Vertical partial laryngectomy
SCPL	Supracricoid partial laryngectomy
TL	Total laryngectomy
5-FU	5-fluorouracil
TEP	Tracheosophgeal puncture
PMMCF	Pectoralis major myocutaneous flap
RFFF	Radial forearm free flap
RT	Radiotherapy
PORT	Postoperative radiotherapy
AST	Aspartate aminotransferase
ALT	Serum alanin aminotransferase

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Introduction:

The pharyngocutaneous fistula (PCF) is the most common complication in the early postoperative period after total laryngectomy. It remains the most troublesome complication after laryngectomy. The incidence of such fistula ranges from 2% to 35 % of cases **(Saki et al, 2008)**.

PCF after total laryngectomy occurs when there is a failure in the pharyngeal repair resulting in a salivary leak. This is not only a demoralizing complication for the surgeons involved, but also for the patients and their families. Its occurrence leads to increased morbidity, delay in adjuvant treatment, prolonged hospitalization, and increased treatment cost **(Dedivitis et al, 2007)**.

Many factors have been indicated as predisposing to fistula formation such as pathological stage of cancer, preoperative radiotherapy, surgical technique, concurrent neck dissection and suture materials used for pharyngeal reconstruction. More over surgeon's ability, pre operative tracheostomy, early oral feeding, preoperative and postoperative hemoglobin levels and the prevalence of systemic diseases such as diabetes mellitus (DM), hypertension and nutritional status are reported to increase the incidence of (PCF). However, to date no conclusive evidence has been gathered about the relative importance of each of these factors **(Galli et al, 2005)**.

Pharyngeal reconstruction after laryngeal oncologic surgery is an important step in the rehabilitation of head and neck cancer patients. With advances in microvascular free tissue transfer, the options for pharyngeal reconstruction have multiplied, but the overall goals remain the same. These goals aim at maximizing the function, especially with regard to swallowing and voice

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restoration, and to minimize the morbidity such as pharyngocutaneous fistula. Despite achieving some of these goals, regardless to the method of pharyngeal reconstruction; pharyngeal fistula is still considered a common post operative complication (**Portugal et al, 2000**).

Individual incidence of pharyngeal fistula depends on important risk factors such as radiotherapy, systemic disease and types of sutures material. The incidence of fistula in cases received preoperative radiotherapy was between 8.3% and 35% of cases, and it was 40% in cases that have systemic disease. With regards to the suture materials the incidence was 9.23% of cases in cases that vicryl 2-0 was used in the pharyngeal repair, incidence (**Cavalot et al 2000**).

Aim of the work:

The aim of this work is to study the incidence of pharyngeal fistula after total laryngectomy for laryngeal carcinoma. We will analyze the incidence, predisposing factors in those patients and their quantitative independent effect in the development of the problem. Protocols of future managements, aiming at reducing such incidence will be studied.

Anatomy of the Larynx

The larynx, the complex organ of voice production, lies in the anterior part of the neck at the level of the bodies of the C3 to C6 vertebrae. It connects the inferior part of the pharynx with the trachea. Although most commonly known for its role as the phonating mechanism for voice production, its most vital function is to guard the air passages, especially during swallowing when it serves as a sphincter or a valve of the lower respiratory tract, thus maintaining a patent airway **(Agur et al ., 2009).**

Laryngeal Skeleton

The laryngeal skeleton consists of nine cartilages joined by ligaments and membranes. Three cartilages are single (thyroid, cricoid, and epiglottic) and three are paired (arytenoid, corniculate, and cuneiform). The thyroid cartilage is the largest of the cartilages. Its superior border lies opposite the C4 vertebra .The cricoid cartilage forms a complete ring around the airway, the only laryngeal cartilage to do so. It is shaped like a signet ring with its band facing anteriorly **(Standring et al., 2008).**

The epiglottic cartilage, consisting of elastic cartilage, gives flexibility to the epiglottis. It is a heart-shaped cartilage covered with mucous membrane. Situated posterior to the root of the tongue and the hyoid and anterior to the laryngeal inlet, the epiglottic cartilage forms the superior part of the anterior wall and the superior margin of the inlet. Its broad superior end is free; its tapered inferior end, the stalk of the epiglottis, is attached to the angle formed by the thyroid laminae and the thyroepiglottic ligament **(Fischer & Josef, 2004).**

The arytenoid cartilages are paired, three-sided pyramidal cartilages that articulate with lateral parts of the superior border of the cricoid cartilage lamina. Each

cartilage has an apex superiorly, a vocal process anteriorly, and a large muscular process that projects laterally from its base **fig (1)** (Skandalakis et al., 2006).

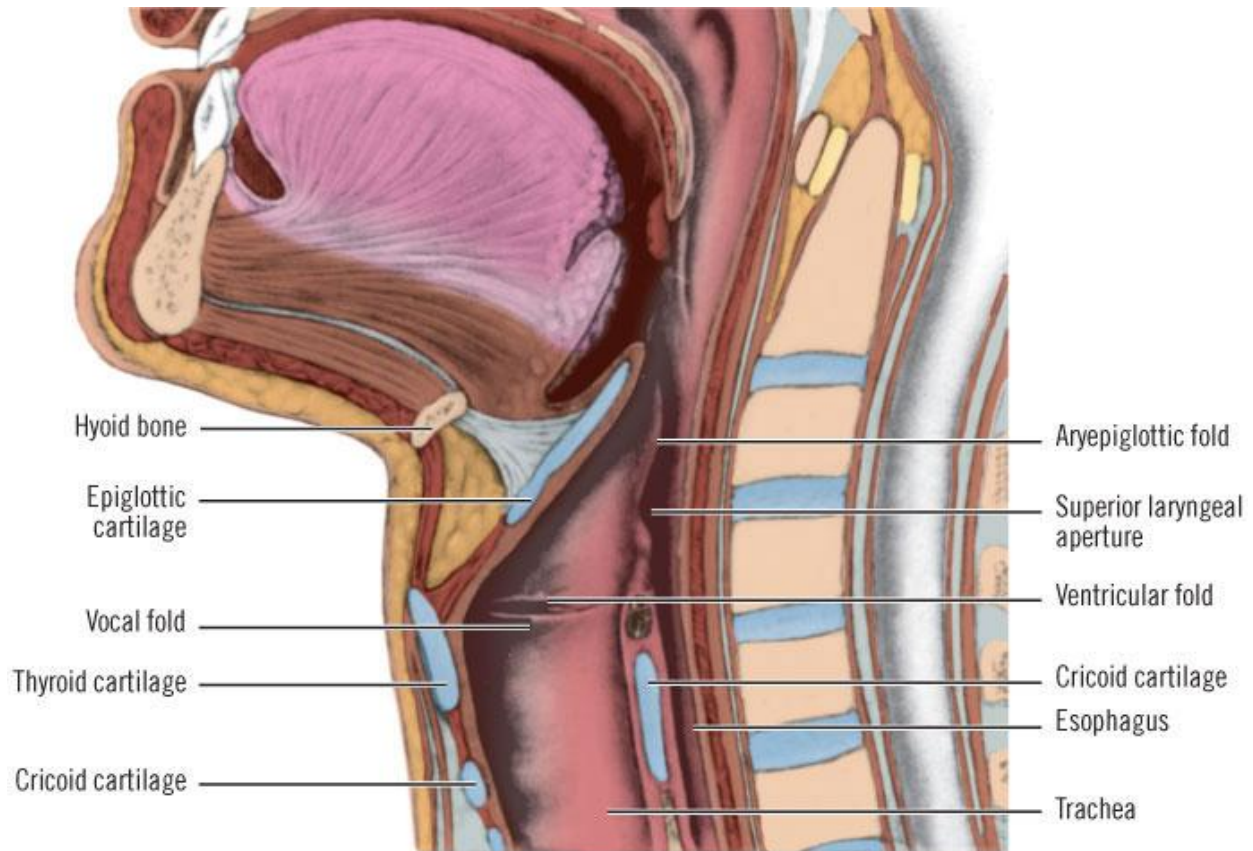


Fig (1): Adult larynx (Skandalakis et al., 2006).

The cricoarytenoid joints, located between the bases of the arytenoid cartilages and the superolateral surfaces of the lamina of the cricoid cartilage, permit the arytenoid cartilages to slide toward or away from one another, to tilt anteriorly and posteriorly, and to rotate. These movements are important in approximating, tensing, and relaxing the vocal folds (Fischer & Josef, 2004).

Surface Anatomy of Larynx

The U-shaped hyoid lies superior to the thyroid cartilage at the level of the C4 and C5 vertebrae. The laryngeal prominence is produced by the fused laminae of the thyroid cartilage, which meet in the median plane. The cricoid cartilage can be felt inferior to the laryngeal prominence. It lies at the level of the C6 vertebra. The

cartilaginous tracheal rings are palpable in the inferior part of the neck. The 2nd to 4th rings cannot be felt because the isthmus of the thyroid gland, connecting its right and left lobes, covers them. The first tracheal ring is just superior to the isthmus (**Agur et al., 2009**).

Interior of the Larynx

The laryngeal cavity extends from the laryngeal inlet, through which it communicates with the laryngopharynx, to the level of the inferior border of the cricoid cartilage. Here, the laryngeal cavity is continuous with the lumen of the trachea. The laryngeal cavity includes the:

- 1) Laryngeal vestibule lies between the laryngeal inlet and the vestibular folds.
- 2) Middle part of laryngeal cavity, the central cavity (airway) between the vestibular and vocal folds.
- 3) Laryngeal ventricles are recesses that extend laterally from the middle part of the laryngeal cavity between vestibular and vocal folds. The laryngeal saccule is a blind pocket opening into each ventricle that is lined with mucosal glands.
- 4) Infraglottic cavity, the inferior cavity of the larynx between the vocal folds and the inferior border of the cricoid cartilage, where it is continuous with the lumen of the trachea (**Skandalakis et al., 2006**).

The vocal folds (true vocal cords) control the sound production. The apex of each wedge-shaped fold projects medially into the laryngeal cavity. Each fold contains:

- 1) Vocal ligament, consisting of thickened elastic tissue that is the medial free edge of the conus elasticus.
- 2) Vocalis muscle composed of exceptionally fine muscle fibers immediately lateral to and terminating at intervals relative to the length of the vocal ligaments (**Moore et al., 2007**).

The vocal folds are the source of sounds (tone) that come from the larynx. The vocal folds produce audible vibrations when their free margins are closely (but not tightly) opposed during phonation and air is forcibly expired intermittently. The vocal folds also serve as the main inspiratory sphincter of the larynx when they are tightly closed. Complete adduction of the folds forms an effective sphincter that prevents entry of air (**Agur et al., 2009**).

The glottis (vocal apparatus of the larynx) makes up the vocal folds and processes, together with the rima glottidis, the aperture between the vocal folds. The shape of the rima (L. slit) varies according to the position of the vocal folds. During ordinary breathing, the rima is narrow and wedge shaped; during forced respiration it is wide and kite shaped. The rima glottidis is slit-like when the vocal folds are closely approximated during phonation. Variation in the tension and length of the vocal folds, in the width of the rima glottidis, and the intensity of the expiratory effort produces changes in the pitch of the voice. The lower range of pitch of the voice of postpubertal males results from the greater length of the vocal folds (**Moore et al., 2007**).

The vestibular folds (false vocal cords), extending between the thyroid and the arytenoid cartilages, play little or no part in voice production. They are protective in function. They consist of two thick folds of mucous membrane enclosing the vestibular ligaments. The space between these ligaments is the rima vestibuli. The lateral recesses between the vocal and the vestibular folds are the laryngeal ventricles fig (2) (**Skandalakis et al., 2006**).