Minimally Invasive Esophagectomy in Esophageal Diseases

Essay

Submitted for partial fulfillment of the master degree in General surgery

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2010

Acknowledgement

First of all, my heartiest thanks to our Lord God, the most kind, most merciful and the most beneficent. I am also deeply so much obliged and can hardly express my hardless and limitless thanks to ***Prof. Dr. Sayed Mohamed Rashad Elsheikh***, Professor of General Surgery, Ain Shams Faculty of Medicine, for his precious remarks, assistance comments, kind encouragement, moral support, continuous advice and sincere assistance for completion of this essay. I heartily and cordially utter all the expressive and impressive words of indebtedness and thankfulness to our honorable ***Dr. Mohamed Mahfouz Mohamed***, Lecturer of General Surgery, Ain Shams Faculty of Medicine, for his patience, valuable guidance cooperative supervision, sincere help and tremendous efforts throughout this work that were the cornerstone in building up of this essay and without his , this work could never have been completed.

Zaghloul Abd elatty

2010

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(III) List of abbreviations

ACA: Adenocarcinoma

AH: Angle of His

AJCC: American Joint Committee on Cancer

ARDS: Acute respiratory distress syndrome

BE: Barrett's esophagus

BMI: Body mass index

BS: Barium swallow

CT: Computerized Tomography

EBE: En bloc esophagectomy

EGD: Esophagogastroduodenoscopy

EMR: Endoscopic mucosal resection

ESD: Endoscopic submucosal dissection

ESD: Endoscopic submucosal dissection

EUS: Endoscopic ultrasound

FDG-PET: Fluorodeoxyglucose - positron emission tomography

FIG: Figure

GEJ: Gastroesophageal junction

GERD: Gastroesophageal reflux disease

HGD: High-grade dysplasia,

HRQoL: Health-related quality of life

ICU: Intensive care unit

IEM: Ineffective esophageal motility

LES: Lower esophageal sphincter

LGD: Low-grade dysplasia

MIE: Minimally invasive esophagectomy

MRI: Magnetic resonance imaging

NBI: Narrow band imaging

NPO: Nil per os

PDT: Photodynamic therapy

PFT: pulmonary function test

PPI: proton pump inhibitor

RLNs: Recurrent laryngeal nerves

SAP: Symptom association probability

SI: Symptom index

SLNs: Superior laryngeal nerves

TEF: Tracheoesophageal fistula

TEF: Transesophageal fistula

THE: Transhiatal esophagectomy

TLESRs: Transient LES relaxations

TNM: Tumor, Lymph node, Metastasis

TTE: Transthoracic esophagectomy

UES: Upper esophageal sphincter

VSE: Vagal-sparing esophagectomy

WNM: Wall penetration, Lymph node, Metastasis

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Introduction

Esophageal cancer is the 7th most frequent among solid cancers in the world, epidermoid or squamos cell carcinoma being the most common histological type. Incidence is the highest in the 6th and 7th decades and it is more frequent in males then in females **(Malaisrie et al., 2004)**.

The risk of cancer development in Barrett's esophagus increases further when high-grade dysplasia develops **(Falk, 2001)**.

Chemical or caustic esophageal injury occurs through ingestion of either strong acids (pH < 2) or alkali (pH >12) **(Lowell, 2006)**. Ingestion is most often seen in adults attempting suicide and children who are victims of accidental poisoning **(Triadafilopoulos, 2005)**. The former tend to ingest larger quantities as they are more motivated to swallow the substance whereas children are more likely to spit out the majority of the poison leaving less to insult the esophagus **(Mamede and De Mello Filho, 2002)**.

Esophageal achalasia is a complex motor abnormality of the esophageal body and lower esophageal sphincter, affecting six in 100,000 individuals, and, after gastro esophageal reflux disease, is the second most common functional disorder of the esophagus requiring surgery **(Nussbaum et al., 2001)**.

Esophageal resection may be a life-saving and life enhancing procedure for esophageal cancer, patient with Barrett esophagus with high grade dysplasia, esophageal strictures and end-stage achalasia. The open operative approaches such as those described by **Orringer et al.,** are still the standard of care for esophageal resections in most medical centers. However, the morbidity and mortality associated with these procedures in most medical centers remains significant **(Wee and Luketich, 2007).**

Traditional open surgical transthoracic and transhiatal esophagectomies are associated with a relatively high morbidity rate of up to 80% and a 5% mortality rate when performed by experienced surgeons. Major complications include pulmonary problems and anastomotic leaks. Other potential problems include intraoperative bleeding, which is more likely to happen

with the transhiatal approach because of the blunt mediastinal dissection, infectious complications and recurrent laryngeal nerve injury **(Nguyen et al., 2000)**.

Since the introduction of laparoscopic fundoplication **(Dallemagne et al., 1991),** improvements in instrumentation and optics have allowed the development of minimally invasive approaches to esophageal diseases that have been traditionally managed by open operation **(Luketich et al., 2000)**.

Minimally invasive esophagectomy has the potential advantages of being a less traumatic procedure with an easier postoperative recovery and fewer wound and pulmonary complications. In addition, good laparoscopic visualization may facilitate mediastinal dissection and decrease the blood loss associated with open transhiatal dissection **(Bottger et al., 2007)**.

THE AIM OF THE WORK

The aim of this work is to clarify the advantages and disadvantages of the novel technique of the minimally invasive esophagectomy.

Embryology of the esophagus

During the embryonic period of development, cephalocaudal and lateral folding of the embryo occurs. As a result, a portion of the endoderm-lined yolk sac cavity is incorporated into the embryo to form the primitive gut. The primitive gut forms a blind-ending tube consisting of the foregut, the midgut, and the hindgut. The foregut gives rise to the esophagus. It extends from the pharyngeal tube as far caudally as the liver outgrowth (**Skandalakis et al., 2004**).

The development of the esophagus begins in the 3rd week of gestation, and by 14th week the fetus takes its first swallow. By the end of the 3rd week of development, the primitive foregut develops a ventral diverticulum from which the tracheobronchial tree develops. The tracheoesophageal septum gradually partitions this diverticulum from the dorsal portion of the foregut, resulting in a ventral respiratory primordium and a dorsal esophagus (Fig 1: A, B) (**Maish, 2007)**.

Immediately after this diverticulum forms, the stomach develop further distally by an asymmetrical extension (**Skandalakis et al., 2004**).

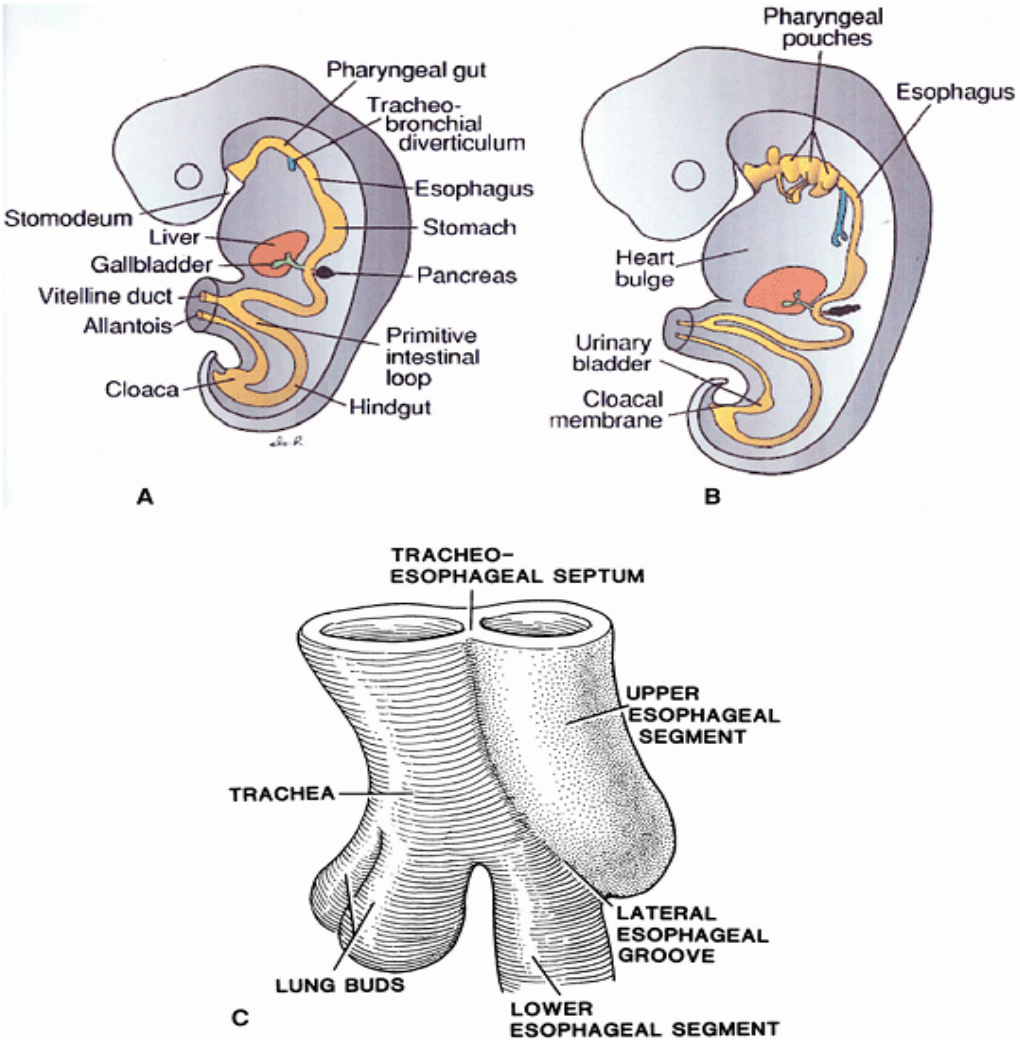

Fig.(1): A,B: Development of tracheobronchial diverticulum from the primitive foregut (4 weeks) **(Sadler, 2006)**. C: Foregut segment in a 4-week-old embryo, showing division into the upper esophageal segment and the primitive lung buds **(Blevins, 2005)**.