Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.JournalofSurgicalResearch.com

Research review

The role of impaired esophageal and gastric motility in end-stage lung diseases and after lung transplantation

Piero Marco Fisichella, MD, and Anahita Jalilvand*

Department of Surgery, Loyola University Medical Center, Maywood, Illinois

ARTICLE INFO

Article history:
Received 15 July 2013
Received in revised form
7 August 2013
Accepted 18 September 2013
Available online 8 October 2013

Keywords:
Gastroesophageal reflux disease (GERD)
Aspiration
Lung transplantation
Ambulatory pH monitoring
Esophageal multichannel pH impedance
Gastric dysmotility
Esophageal motor dysfunction

ABSTRACT

Today, many questions persist regarding the causal relationship of gastroesophageal reflux disease (GERD) to promote aspiration and its potential to induce both pulmonary and allograft failure. Current hypotheses, which have identified GERD as a nonimmune risk factor in inducing pulmonary and allograft failure, center on the role of GERD-induced aspiration of gastroduodenal contents. Risk factors of GERD, such as impaired esophageal and gastric motility, may indirectly play a role in the aspiration process. In fact, although impaired esophageal and gastric motility is not independently a cause of lung deterioration or allograft failure, they may cause and or exacerbate GERD. This report seeks to review present research on impaired esophageal and gastric motility in end-stage lung disease to characterize prevalence, etiology, pathophysiology, and current treatment options within this special patient population.

Published by Elsevier Inc.

1. Introduction

Lung transplantation becomes an eventuality in most patients with end-stage lung diseases (ESLDs). Because the failure of lung transplantation is largely determined by the development of bronchiolitis obliterans syndrome (BOS), a disease process whose pathophysiology is largely unknown, finding modifiable risk factors able to avoid or retard its development and progression has been of significant importance. Recent literature on this subject has demonstrated a significant prevalence of gastroesophageal reflux disease (GERD) in various types of ESLDs, including idiopathic pulmonary fibrosis (IPF), cystic fibrosis (CF), and connective tissue disorders (CTDs), such as scleroderma [1–4]. Research has also attempted to elucidate the association between GERD and BOS after lung transplantation and has not only shown a very convincing connection between the development of GERD and the progression of BOS, but it has equally shown that effective management of GERD with laparoscopic antireflux surgery (LARS) can decrease the incidence of BOS [5–7].

Although the association between GERD and progression of BOS has been adequately proven in the literature, the pathophysiology linking the two disease processes is not well understood or accepted. Theories have proposed that along

* *Corresponding author*. Department of Surgery, Swallowing Center, Loyola University Medical Center, South 1st Avenue, Maywood, IL 60606. Tel.: +1 708 327 2820; fax: +1 708 327 3492.
E-mail address: pfisichella@lumc.edu (P.M. Fisichella).
0022-4804/$ – see front matter Published by Elsevier Inc.
http://dx.doi.org/10.1016/j.jss.2013.09.023

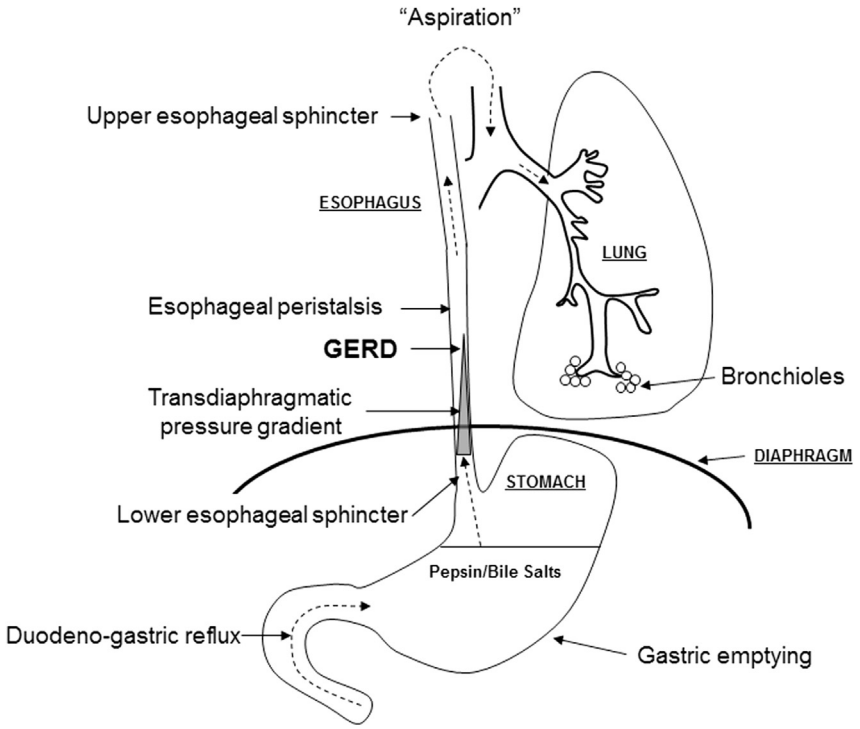

Fig. 1 – The artist's representation illustrates the proposed mechanisms by which aspiration of GERD is thought to induce lung deterioration and BOS. Risk factors of GERD that may play a role in the pathophysiology of GERD-induced aspiration are depicted: decreased esophageal peristalsis, hypotensive LES, TLESR episodes, DGE, the presence of duodenogastric reflux, and a transdiaphragmatic gastroesophageal pressure gradient.

with immunologic factors, nonimmune factors, such as GERD-induced aspiration, could induce pulmonary and allograft failure. According to these theories, continuous exposure to gastroduodenal substances, such as pepsin and bile acids, is more likely to be correlated with the development of BOS [5,8]. Therefore, GERD is thought to play a crucial role in aspiration-mediated lung injury both before and after lung transplant. Risk factors for GERD, such as impaired esophageal and gastric motility, may indirectly affect the aspiration process. In fact, although impaired esophageal and gastric motility is not independently a cause of lung deterioration or and allograft failure, they may cause and or exacerbate GERD (Fig. 1).

This report seeks to review present research on impaired esophageal and gastric motility in ESLD, and after lung transplantation to characterize prevalence, etiology, pathophysiology, and current treatment options. By integrating the research performed at our institution with a detailed review of the relevant literature, we have sought to shed more light on the role of such risk factors for GERD in ESLDs and after lung transplantation.

The introduction of sophisticated diagnostic technologies, such as high-resolution manometry (HRM) and multichannel pH-impedance testing, has allowed clinicians to document subtle motility pattern disturbances along with nonacidic reflux events previously undetectable or indistinguishable from GERD [9,10]. With increasing availability and incorporation of such diagnostic testing, abnormalities in patients with ESLDs and lung transplantation have been better recognized (Figs. 2–4). For example, although the high prevalence of abnormal gastroesophageal reflux in patients with IPF has been clearly and extensively documented in the literature, recent studies have incorporated new diagnostic testing for esophageal motility and GERD in this patient population [11]. A recent prospective study conducted by Rhagu *et al.* in 2006 reported that 87% of 65 IPF patients had abnormal reflux determined by the use of 24-h pH monitoring, which was thought to be an underestimate because 65% of the patients were on antireflux medication [1]. However, despite the increased prevalence of GERD in patients with IPF, the contribution of abnormalities of esophageal peristalsis and the lower esophageal sphincter (LES) on the development of GERD in these patients is less clear and may reflect patient selection in different lung transplant centers or study methodology. For instance, colleagues at the University of California, San Francisco, evaluated 109 patients with ESLD awaiting lung transplantation and found a high prevalence of a hypotensive LES (55%) and impaired esophageal peristalsis (47%) among patients with GERD. Patients with IPF, however, comprised only 25% of the patient population [12]. Another follow-up study on 35 patients with GERD (15 patients before and 20 patients after transplantation) showed that impaired esophageal peristalsis was frequent (it was present in 10 of 15 patients before transplantation and in 15 of 20 patients after transplantation), although only five and four patients had IPF before and after transplantation, respectively [13].

To further clarify the role of abnormal esophageal motility in patient with IPF, a study jointly conducted at our institution and University of Chicago attempted to bring to light this point by using HRM, barium swallow, 24-h pH monitoring, and upper endoscopy to characterize patterns of esophageal