Diet and Gastroesophageal Reflux Disease: Role in Pathogenesis and Management

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Abstract and Introduction

Abstract

Purpose of review Gastroesophageal reflux disease (GERD) is a common disease that presents with a variety of symptoms including heartburn and acid regurgitation. Although dietary modification is currently regarded as first-line therapy for the disease, the role of diet in the pathogenesis and management of GERD is still poorly understood. The present article aims to review recent literature that examines the relationship of diet and GERD.

Recent findings Increased awareness of medications side effects and widespread overuse has brought nonpharmacological therapies to the forefront for the management of GERD. Recent findings have established the important role of nutrition for the managements of symptoms of GERD. Increasing scientific evidence has produced objective data on the role of certain trigger foods, whereas population studies endorse decreased reflux symptoms by following certain diets. Obesity has been linked with increased symptoms of GERD as well. Furthermore, the importance of lifestyle techniques such as head of bed elevation and increased meal to sleep time may provide nonpharmacologic methods for effective symptom control in GERD.

Summary We provide a comprehensive review on the association between diet and its role in the development and management of GERD.

Introduction

Gastroesophageal reflux disease (GERD) is a common medical condition characterized by the development of chest and epigastric symptoms because of reflux of gastric components into the esophagus.[1] The most common esophageal symptoms are heartburn, acid regurgitation, dysphagia, and chest pain. However, the disease may be associated with extraesophageal symptoms such as cough, voice change, nausea, and asthma.[2] As one of the most common gastrointestinal diseases, it affects 13–19% of people worldwide and has a greater prevalence in the western world, with population-based studies suggesting a prevalence of 10–40% in North America and Western Europe.[3,4] Just as well recognized is the lower prevalence seen in various parts of the world ranging from less than 10% in South America and Eastern Europe to significantly lower in Asia.[5] Symptoms of GERD can cause lifestyle disturbances by affecting patients' daily functioning and sleep, which may lead to a significant decrease in patients' quality of life measures.[3] Persistent GERD is also known to lead to complications such as Barrett's esophagus, esophageal strictures, and adenocarcinoma.[6]

The increasing prevalence of GERD over the last two decades represents a challenge for primary care physicians and specialists alike.[4] The costs associated with management of this disease also represent a significant burden on health systems. It has been estimated that the annual cost of healthcare and lost productivity because of GERD in the United States alone approaches $24 billion, with 60% of that being spent on medications.[1] The average annual medical costs for patients with GERD are almost double that of those without the disease because of additional outpatient visits, hospitalizations, emergency department utilization, and pharmacy costs.[1]

At this time there exists no definitive simple diagnostic test for GERD. The presence of clinical symptoms alone is an indication for treatment with a 2-week trial of proton pump inhibitor (PPI) therapy. Patients without improvement of symptoms may be considered for ambulatory pH monitoring and/or endoscopy to establish a more definitive diagnosis. The prevalent thought is that transient lower esophageal sphincter relaxation and the presence of significant hiatal hernia contribute to development of the disease.[7] GERD is recognized as a multifactorial disease process with variable findings on endoscopy.[8] The most common finding on esophagogastroduodenoscopy (EGD) is nonerosive reflux disease in which there is no endoscopic evidence of macroscopic esophagitis.[4] Erosive reflux disease which is characterized by the presence of mucosal breaks in the lower esophagus at endoscopy is less commonly observed.[9] Nonerosive disease has been associated with a higher occurrence of functional gastrointestinal disorders and esophageal acid hypersensitivity.[9] In cases when endoscopy is normal, pH measurement with or without impedance studies may demonstrate esophageal acid reflux.

Current Management

Currently, the predominant pharmacological therapy for GERD is acid suppression, making PPIs among the most widely prescribed medications in the United States for decades. This is largely because of the prevalence of GERD and gastrointestinal bleeding combined with the belief that PPIs have few side effects. However, recent observational literature has demonstrated that PPI therapy is associated with many potential side effects such as increased risk of acute and chronic kidney disease, hypomagnesemia, *Clostridium difficile* infection, dementia, and osteoporotic fractures.[10] Although further studies are necessary to more clearly elucidate these risks, such alarming data further underscore the importance of nonpharmacologic methods for controlling of GERD.

At this time, the first-line therapy for patients with GERD is dietary modification, which has been endorsed by the National Institutes of Health and the American College of Gastroenterology.[1] However, few studies have embarked upon the task of evaluating the role of diet in GERD. Thus, there exists an overall paucity of data on the role of diet in the pathogenesis and management of the disease. The aim of this article is to review the recent literature on the relationship between gastroesophageal reflux and nutrition and provide a summary of the latest advancements in the field.

Food Composition

The increasing prevalence of GERD along with its increasing prevalence in the Western world has encouraged examination of food and dietary habits as a potential cause or exacerbating factor in the development of reflux symptoms. Although anecdotal evidence has suggested associations with certain foods (fats, nonvegetarian, fried foods, and beverages) with reflux symptoms, objective evidence based data in this field remain unclear. Recent evidence points to the increasing importance of lifestyle in disease development as well.

Citrus and other acidic foods such as tomatoes are considered to trigger reflux symptoms. A study assessing the physiologic dynamics of ingesting acidic foods noted that acidic liquids took longer to drink, required a higher number of swallows, had a slower duration of ingestion, and contained a smaller volume in each swallow when compared to a neutral bolus.[11] This suggests a possible mechanism for the worsening of reflux symptoms in some patients, with ingestion of acidic foods such as fruits, juices, coffee, and carbonated beverages. The effect of different foods on patient's subjective perception of symptoms often leads patients to self-modify their diet decreasing their consumption of food that exacerbates reflux symptoms. This was seen in a community-based cross-sectional study that evaluated adherence of patients with GERD to dietary guidelines finding that patients avoided some (liquor and citrus foods) but not all foods traditionally attributed to worsen GERD symptoms.[1]

Ingestion of nonvegetarian foods has been noted to worsen GERD symptoms, whereas a diet consisting of greasy foods was independently associated as a risk factor for the development of nonerosive reflux disease.[5] Diets high in fat may be a risk factor for development of Barrett's esophagus, whereas diets rich in fruits and vegetables have a protective effect.[6] It is also important to note the GERD is part of a larger cohort of upper gastrointestinal symptoms which includes dyspepsia as well. The use of canned foods and alcohol has been associated with functional dyspepsia using multivariate analysis. Disease symptoms from canned foods may be because of the individual components such as food additives, food pH, and tin material.[5] High fat meals may decrease lower esophageal sphincter pressure (LESP) compared to a high protein meal of the same caloric value. A higher fat meal content also correlated with increased acid exposure time in patients when compared to a low fat meal. At the same time, it bears mentioning that other randomized trials were unable to replicate differences in LESP, transient LES relaxations, number of reflux episodes, or esophageal exposure to acid dependent on fat content in meals.[11]

Chocolate is often implicated in the worsening of reflux symptoms. Although ingestion of chocolate has been shown to decrease LESP and increase acid exposure time, no studies have assessed the benefit of chocolate abstinence.[12]

Various diet plans have been explored to improve GERD symptoms, especially in patients with other comorbid conditions. For example, in patients with inflammatory bowel disease, an improvement of reflux symptoms after initiation of a gluten free diet was noted.[13] A Mediterranean diet is characterized by a high intake of vegetables, legumes, fruits, whole grains, fish, and olive oil, moderate amounts of alcohol and dairy products, and low amounts of red or processed meat. Its benefit in cardiovascular disease, cancer, and diabetes is extensively documented, including prospective trials.[14] Mone *et al.*[15] performed a cross-sectional study involving 817 participants and found that following a Mediterranean diet decreased the risk for GERD symptoms. When controlled for eating habits (meal regularity, eating rate, and meal-to-sleep interval), the positive association between GERD and a Mediterranean diet persisted.[15] Examination of individual food items has established foods that may help with disease control as well. A Japanese study found that daily ingestion of the high fiber fruit, Japanese apricot, was associated with decreased symptoms of esophageal dysmotility (belching, early satiety, bloating, and heaviness) without affecting acid type symptoms in patients with GERD.[16]

Beverages

Beverage choice and frequency has been seen to affect GERD symptoms as well. Ingestion of alcohol exacerbates symptoms of GERD by decreasing LES pressure, increasing acid secretion through gastrin stimulation, decreasing esophageal motility, and impairing gastric emptying. Randomized and cross-sectional studies have demonstrated increased prevalence of symptomatic reflux in alcohol users.[12] Nonalcoholic beverages such as soft drinks, which are often carbonated, have been shown to cause a short term reduction in the intra-esophageal pH and a transient decrease in the LES basal pressure, increase gastric acid secretion, and cause gastric distention and acid reflux.[17] Ingestion of carbonated water, caffeinated cola, or caffeine-free cola were associated with a reduced LES pressure compared with tap water ingestion.[17] Patients with moderate to severe symptoms of GERD were found to be more likely to consume beverages such as soft drinks and one or more cups of regular tea as compared to asymptomatic controls.[1] In a multicenter, longitudinal trial, consumption of carbonated drinks was associated with nocturnal heartburn. Thus, patients suffering from nighttime heartburn or awakenings are advised to avoid consumption of carbonated beverages.

Although common practice has associated increased disease activity with drinks such as coffee, a recent meta-analysis noted no significant association between coffee intake and GERD symptoms. The researchers found no correlation between presence of symptoms and severity based upon the amount of coffee intake or assessment of exposure.[18] However, a 2014 cross-sectional cohort study that compared adherence of dietary guidelines in patients with GERD revealed that patients with moderate to severe reflux were more likely to consume one or more cups of tea a day compared to asymptomatic controls [odds ratio (OR) = 1.86; 95% confidence interval (CI), 1.16–2.97, for severe GERD].[1]

Eating Behavior

Along with diet, an important lifestyle component of GERD symptoms is the relationship of meals to sleep. Murase *et al.*[3] demonstrated that decreased duration of sleep was associated with unfavorable dietary habits and increased symptoms of GERD. In addition, both GERD and poor dietary behaviors such as dinner within 2 hours of bed time and snacking after dinner were independently associated with short sleep duration.[3] These results compare favorably with newer studies as well.[15]

Late evening meals are associated with increased time of supine acid exposure as compared to early meal times. Encouraging patients to elevate the head of the bed while supine post prandial has been demonstrated to decrease time of esophageal acid exposure as compared to a flat position.[7] Head of bed elevation has been recommended to patients in an attempt to decrease the reflux of acid stomach contents that may occur when patients are lying flat. As compared to patients sleeping in a flat position, head of bed elevation with 28 cm blocks was associated with faster acid clearing, fewer reflux episodes, and shorter reflux episodes.[12] Sleeping with a wedge has also been associated with decreased esophageal acid exposure. Conversely, sleeping in the right lateral decubitus position was associated with increased reflux possibly because in this position the acid pocket is closer to the esophago-gastric junction.[19] Such a strategy may be especially beneficial in patients with late evening or nocturnal GERD. Furthermore, patients with symptoms of obstructive sleep apnea have an increased risk of development of Barrett's esophagus, which is likely mediated by worsening GERD.[20]

Obesity and Exercise

It has not gone unnoticed that the increased global prevalence of GERD is associated with a parallel rise in the obesity epidemic. Currently, more than one third of adults in the United States are obese.[21] Weight loss has long been suggested as a conservative method of GERD management, based on assumed pathophysiology rather than objective data. The development of increased abdominal pressure in patients with obesity leads to the disruption of the gastro-esophageal junction and hiatal hernia. Furthermore, obesity may affect esophageal motility and weight loss has been associated with reduced esophageal acid exposure.[7] Recent literature demonstrates that patients with an increased BMI have more acid reflux by pH testing, more severe and more frequent reflux symptoms and endoscopic findings of erosive esophagitis.[7] This increased time of esophageal acid exposure is supported by several prospective observational studies. Weight gain of as little as 3.5 BMI units was associated with a threefold increased risk of developing reflux symptoms.[4] A seminal article published by Jacobson *et al.*[22] with data from the cohort of the Nurses' Health study of 10 545 women confirmed a dose-dependently reduced risk of reflux symptoms among women who had a decrease in BMI compared with women with no BMI change (OR = 0.64; 95% CI, 0.42–0.97; BMI decrease >3.5 units; $P_{trend} < 0.001$). In addition, the authors noted that in women with a normal BMI, an increase in BMI of more than 3.5, as compared with no weight changes, was associated with an increased risk of frequent symptoms of reflux (OR = 2.80; 95% CI, 1.63–4.82).[22]

A study by de Bortoli *et al.*[4] demonstrated that achievement of a 10% weight loss was associated with significant decrease in reflux symptoms, namely heartburn, regurgitation, noncardiac chest pain, and belching. Patients in the weight loss cohort, which demonstrated a 5-point reduction of BMI through the addition of a low calorie diet and aerobic exercise, were more frequently

able to decrease the dose of their PPI therapy or discontinue use of these drugs. A noninvasive approach such as weight loss should be encouraged for all patients with symptoms with or without endoscopic disease. It may best be achieved through a low-fat, high-carbohydrate, and low calorie diet. It is also reasonable to assume that an unhealthy diet is a common risk factor for both GERD and obesity.

Along with diet control, regular aerobic exercise may help in the management of GERD. Obese patients are known to have increased incidence of reflux symptoms and decreased frequency of exercise.[4] It has been suggested that regular exercise is associated with strengthening of the striated muscle in the diaphragmatic crura leading to a stronger anti reflux barrier.[8] Population based studies have demonstrated a lower occurrence of GERD in patients who exercise frequently. In addition, the beneficial effects of exercise on overall medical heath and other commodities cannot be understated.

Tobacco and Substance use

Tobacco use is implicated in the exacerbation of reflux symptoms and cessation of use has been associated with reduced reflux symptoms.[7] A large prospective population based cohort study consisting of 29 610 participants demonstrated decreased symptoms of severe reflux in normal weight individuals on medical treatment compared to patients who continued daily tobacco use (OR = 5.67; 95% CI, 1.36–23.64).[23] These findings were not duplicated in obese patients, possibly because of the different pathophysiology of GERD in obesity as compared to tobacco use.[23] Prior literature also showed that the duration of smoking was associated with esophageal dysmotility and emptying.[12] Use of other substances such as hookah smoking and opium use in noncigarette smokers may have a positive correlation with GERD symptoms as well.[24]

Conclusion

GERD is one of the most common medical conditions encountered in both the primary care and specialty care setting. Diagnosis and management of the disease is expensive and pharmacologic therapy may be associated with side effects. The present review serves to highlight the importance of diet in the management of the disease. Effective dietary modification through avoidance of certain foods and lifestyle changes may lead to improved disease control and prevention of complications.

Sidebar

Key Points

- GERD is a common medical condition especially prevalent in the Western world, which has led to the explosive use of PPI therapy. However, diet modification remains first-line therapy.
- Certain foods such as citrus, liquor, carbonated beverages are known triggers that may worsen symptoms.
- Obesity has been linked with increased symptoms of GERD. Conversely, a decrease in BMI is associated with a decrease in reflux symptoms.
- Lifestyle modifications such as avoiding late evening meals, night time snacking, head of bed elevation may improve symptoms.

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