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Neurogastroenterology and GI Motiliy (H Parkman and R Schey, Section Editors)

Rumination Syndrome: Recognition and Treatment

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Key Points

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Rumination syndrome is defined as effortless postprandial regurgitation that patients may characterize as vomiting.

Diagnosis of rumination syndrome is clinical but supported by objective testing such as HREMI.

Treatment is primarily diaphragmatic breathing; however, baclofen has also showed nominal benefit.

Keywords Rumination · Belching · Vomiting · Regurgitation

Abstract

Purpose of review The purpose of this paper is to discuss current diagnostic and treatments of rumination.

Rumination is often underdiagnosed or misdiagnosed in adults, especially when symptoms suggest regurgitation rather than vomiting accompanied by re-chewing and re-swallowing and should be included in the differential diagnosis. It is primarily diagnosed clinically by ROME-IV or DSM-5.

Recent findings That rumination can be re-affirmed by characteristic patterns on objective testing such as high-resolution esophageal manometry and 24-h pH impedance testing. However, although gastroduodenal manometry and EMG are helpful, these tests are slowly losing interest given their technical nature of data gathering, time consumption, cost burden, and patient discomfort.

Summary Rumination is primarily diagnosed clinically by ROME-IV or DSM-5 in addition to high-resolution esophageal manometry and 24-h pH impedance. Management is challenging and usually a combination of behavioral, pharmacological, and rarely surgical treatment. Recent data demonstrate that the combination of behavioral techniques such as diaphragmatic breathing exercises and/or with baclofen has promising results. Further research is necessary to further define objective criteria for diagnosis and other therapeutic modalities for treatment.

Introduction

Rumination syndrome is a functional gastrointestinal disorder that is widely recognized as repetitive, effortless regurgitation during or after ingestion of food within seconds to minutes followed by the need to re-chew, re-swallow, or ejection of the bolus without preceding nausea, heartburn, or abdominal pain. [1•, 2••, 3, 4••] A syndrome, once traditionally considered in children or adolescents with autism or developmental delay, now has been accepted to occur even with normal cognitive function and in adults. Although data on the incidence and prevalence are very limited, the prevalence in adults was found to be 0.8–0.9% in two population-based studies, and a much higher prevalence has been reported among various special populations. [5–8] The exact pathophysiology is not concrete and is unclear, though it has been suspected that the episodes are triggered by an increased intragastric pressure from an unintentional, unnoticed, voluntary abdominal wall contraction. [3] The elevated intragastric pressures and negative intrathoracic pressure allow the gastric bolus to retrograde reflux into the esophagus and into the oropharyngeal cavity. These episodes can be preceded by reflux termed as reflux-rumination or happen as primary event. The clinical presentation can overlap with symptoms of GERD, particularly when patients describe their symptoms as "vomiting." [1•, 2••, 3] This can lead to misdiagnosis of differential disorders such as gastroparesis, refractory vomiting, or gastroesophageal reflux disease (GERD). Diagnosis is based on criteria set forth by ROME-IV or Diagnostic and Statistical Manual of Mental Disorders Fifth Edition (DSM-5) and is generally clinically supported by objective testing. Effective history taking is key to delaying the diagnosis. If suspected, further testing such as high-resolution esophageal manometry with pH impedance testing (HREMI) can be performed to support the diagnosis. Management can be behavioral including diaphragmatic breathing or pharmacological. Failure to detect this diagnosis can lead to unnecessary testing, invasive procedures such as surgery or feeding tubes, increased financial burden, psycho-social impact, and a reduced quality of life that can lead to significant functional impairment and nutritional deficiencies with weight loss. [3] This chapter will discuss clinical features, diagnostic findings, and management to better understand rumination syndrome.

Symptoms

The term "ruminate" shares meaning from Latin word "*ruminari*" and is defined in the dictionary as "to chew repeatedly for an extended period." [9] It is often described in relation to a normal process in cows that chew the cud by means of chewing, swallowing, regurgitating, and re-chewing again. In humans, this is considered an unnatural mode of ingestion and digestion. Rumination syndrome presents with certain distinct presentations that can help differentiate from other diagnoses. It typically occurs 10 to 15 min after a meal, but can persist for up to 1 to 2 h, and can occur even after ingestion of liquids only. The regurgitated material might be swallowed again or expectorated. [25] During history taking, patients may often present with predominant symptom being "vomiting" after eating. It is important to distinguish vomiting from rumination. Vomiting is usually preceded by retching, which is an energetic and forceful process that leads to involuntary expulsion of the stomach contents through the mouth, whereas in rumination, the partially digested food is effortlessly regurgitated, that is voluntary, unintentional, and without noticing.

The partially digested food in rumination can have an intact taste as opposed to the acidic and foul taste of vomiting. There is generally no nausea, significant heartburn, or abdominal pain. Patients can present with early satiety, fullness, and discomfort. [10] This can lead to nutritional deficiencies or weight loss as this is seen in close to 50% of the patients. [3, 11] However, electrolyte disturbances, malnutrition, and dental erosions appear much less common in adult patients. Vijayvargiya et al. reported that 57 (13%) of 438 adults and adolescents with RED (rectal evacuation disorder) had concomitant rumination syndrome and termed the phenomenon "Rumination and RED" syndrome. [11, 12] In addition, nocturnal symptoms that can be present in GERD are absent in rumination syndrome and are primarily present in the prandial or postprandial phase.

Diagnosis

Rumination syndrome is a clinical diagnosis based on the either the Rome IV Criteria produced by the Rome Foundation or Diagnostic and Statistical Manual of Mental Disorders Fifth Edition (DSM-5). Patients may also undergo motility testing such as manometry to support the diagnosis.

The following is the Rome IV criteria: [13]

- Persistent or recurrent regurgitation of recently ingested food into the mouth with subsequent spitting or remastication and swallowing
- Regurgitation is not preceded by retching.

Supportive criteria include the following:

- Effortless regurgitation events are usually not preceded by nausea
- Regurgitant contains recognizable food that might have a pleasant taste
- The process tends to cease when regurgitated material becomes acidic
- Criteria fulfilled for the last 3 months with symptom onset at least 6 months before diagnosis.

The following is the DSM-5 criteria: [14]

- Repeated regurgitation of food over a period of at least 1 month. Regurgitated food may be re-chewed, re-swallowed, or spit out.
- The repeated regurgitation is not attributable to an associated gastrointestinal or other medical condition (e.g., gastroesophageal reflux, pyloric stenosis).
- The eating disturbance does not occur exclusively during the course of anorexia nervosa, bulimia nervosa, binge-eating disorder, or avoidant/restrictive food intake disorder.
- If the symptoms occur in the context of another mental disorder (e.g., intellectual disability [intellectual developmental disorder] or another mental disorder), they are sufficiently severe to warrant additional clinical attention.

Rome IV recommendations advocate it is not necessary to perform unnecessary diagnostic testing to rule out other organic etiology when criteria are met as this can be time consuming, expensive, expose to risk, and discomfort to patients. In addition, a study by O'Brien et al. mentioned that clinical features

should be emphasized on a greater scale than relying on gastroduodenal manometry by demonstrating a study that only 33% confirmed the clinical diagnosis of rumination syndrome. [11] However, since the symptom presentation can be broad and have possible co-existing gastrointestinal pathology, patients often end up getting a battery of tests including barium esophagogram, esophagogastroduodenoscopy (EGD), and/or high-resolution esophageal manometry with 24-h pH impedance testing.

Various motility diagnostic testing has shown a revealing pattern for rumination syndrome. This can be particularly advantageous when patients present with multitude of symptoms that may overlap with GERD. Objective testing includes gastroduodenal manometry, electromyography (EMG), and HREMI. Studies utilizing these testing techniques have demonstrated higher gastric sensitivity and LES relaxation during gastric distention in patients with rumination syndrome. In addition, a link was made between regurgitations that occurred in the early post prandial phase to abdominal contractions that occurred concurrently with LES relaxation. Distinguishing "R-waves," representing characteristic spike pattern recorded simultaneously across all sensors were found on gastroduodenal manometry. EMG showed activation of intercostal and abdominal wall muscles during rumination episodes. [15–19] Both gastroduodenal manometry and EMG were helpful, however slowly lost interest given their technical nature of data gathering, time consumption, cost burden, and patient discomfort.

A motility test that is now increasingly utilized is HREMI performed post-prandially, which can reduce the burden of variables as discussed above. [20] Reflux events can be made evident on manometry during a swallow by toggling on the impedance channel button or by performing an ambulatory 24-h pH impedance testing using a multichannel catheter, which can show either acid or non-acid gastric contents with extent into the proximal esophagus. Another value of this ambulatory motility test is that patients can click a button to mark their onset of symptoms. This is superimposed on continued data recording and analyzed after the study is finished. This helps in correlating reflux events to patient symptoms.

The characteristic pattern of rumination syndrome on HREMI findings will show a distinguished increased intragastric pressure immediately after swallow initiation with concomitant retrograde bolus movement on impedance channel (Fig. 1). [21–23] As inferred earlier, GERD is often the culprit to represent reflux events on HREMI; however, patterns have been recognized to suggest that these certain reflux events could be correlated to post prandial regurgitation as present in rumination syndrome. [24] Kessing et al. supported HREMI post-prandially as a diagnostic tool for rumination syndrome. In their study, they compared GERD patients to rumination patients and showed rumination patients had increased abdominal pressure > 30 mmHg associated with proximal esophageal reflux events on high-resolution esophageal manometry. However, no standardized protocols for testing currently exist.

PH impedance testing exhibited increased proximal reflux events in rumination patients versus GERD patients. [25] Ambulatory pH impedance testing has also proven to identify features of rumination syndrome. Nakagawa et al. looked at refractory GERD patients and hypothesized a significant percentage may have rumination syndrome. Using 24-h ambulatory multichannel intraluminal impedance-pH monitoring system, they found that patients with

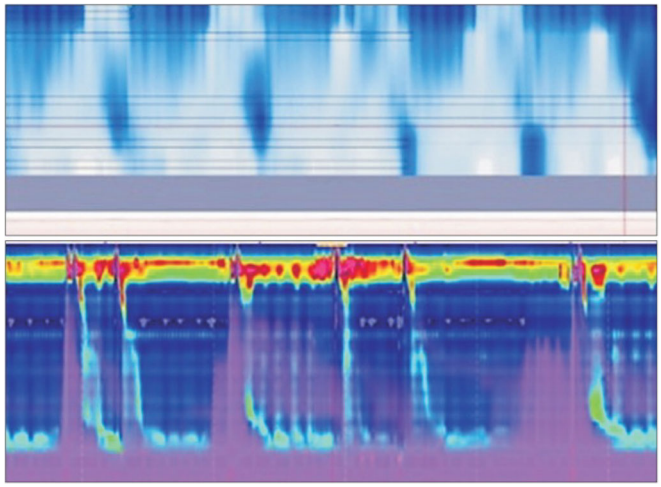

Fig. 1. A characteristic pattern of rumination on HREMI and 24-h pH impedance testing. Note a simultaneous pressure zone present shortly after initiation of swallow that extends below the crural diaphragm suggesting contraction of the intra-abdominal muscles with elevated gastric and esophageal pressures. Illustration acquired with permission from The Korean Society of Neurogastroenterology and Motility

rumination had significantly more postprandial early non-acid reflux with greater proximal esophageal involvement. Moreover, this subset of patients also had a distinct nadir pH profile overtime from non-acid to acid. Rumination patients also marked their symptoms on the device earlier and more frequently than GERD patients. Interestingly, these rumination patients were largely younger females. The findings also lead the authors to propose a rumination score with high sensitivity and specificity that can be applied for patients with refractory GERD undergoing this testing. [26] L. Shim et al. illustrated in a publication an interesting link between severe ineffective esophageal motility (IEM) (Chicago Classification version 3.0) and rumination syndrome. They report a case of a patient whereby bolus stagnation with severe IEM triggered the rumination episodes, which subsequently improved by initiating bethanechol, a non-selective muscarinic agonist that has been shown to augment weak esophageal distal smooth muscle contractions in IEM. Thereby concluding that patients that may present with rumination syndrome should be considered for a differential diagnosis of severe IEM. [21]

Treatment

Management of rumination syndrome can be separated into behavioral, pharmacological, and surgical. To recap, suspected pathophysiology of rumination syndrome is related to gastric distention causing abnormal contractions of the abdomen that triggers regurgitation episodes. Hence, altering the cycles of these abdominal contractions by implementing coordinated respirations and improving diaphragmatic muscle control may offset rumination episodes. The most studied behavioral treatment for rumination syndrome is diaphragmatic breathing exercise. Patient is instructed to place one hand on chest and other hand on abdomen; then asked to inhale while informing the patient to retain the hand on chest in same position while hand on abdomen is moved out

(Fig. 2). This can be instructed with or without biofeedback. Biofeedback refers to behavioral training using audio and visual feedback from the trainer and an instrument to better control impaired voluntary muscle function. In this case, electromyography or esophageal manometry to help coordinate respirations to diaphragmatic contractions by allowing the patient to understand the objective abnormality present of the physiological process on the instrument and thereby correcting it with guidance from trainer.

Diaphragmatic breathing with manometric biofeedback has shown to decrease intra-gastric pressure and increase LES pressures to prevent outflow of post prandial bolus. [22] The disadvantageous aspects of biofeedback are increased cost, time consumption, complexity, and limitation for those who are audio or visually impaired. Fortunately, a single session can teach patients without biofeedback how to perform diaphragmatic breathing exercise at home. No specific regimen has shown to be most effective, though a recent publication recommend practicing diaphragmatic breathing exercise for 15 min after ingestion of a meal or duration tailored to longevity of rumination episode. Furthermore, this exercise should be learned and perfected by practicing various times of day even without symptoms and in upright, sitting, and supine positions. [27•] Needless to say, all meals should be consumed in the upright position for optimal delivery of the food bolus. When there is minimal or no improvement in patient symptoms, barriers should be assessed for correct diaphragmatic breathing technique or referral made to behavioral therapy specialist to implement cognitive behavioral strategies. In addition to gastric distention and irregular abdominal contractions, second observed defect in rumination syndrome that is objectively supported by HREM is transient LES relaxation associated with regurgitation.

Pharmacological treatment options are limited at this time, but further research is underway. Baclofen, a γ-aminobutyric acid agonist, is an antispasmodic agent that has shown to increase post prandial LES pressure and reduce number of transient lower esophageal sphincter relaxation episodes. A recent study demonstrated that baclofen 10 mg 3 times daily compared with placebo led to a modest reduction in flow events during a postprandial manometry, and 63% of patients reported symptom improvement during the baclofen period

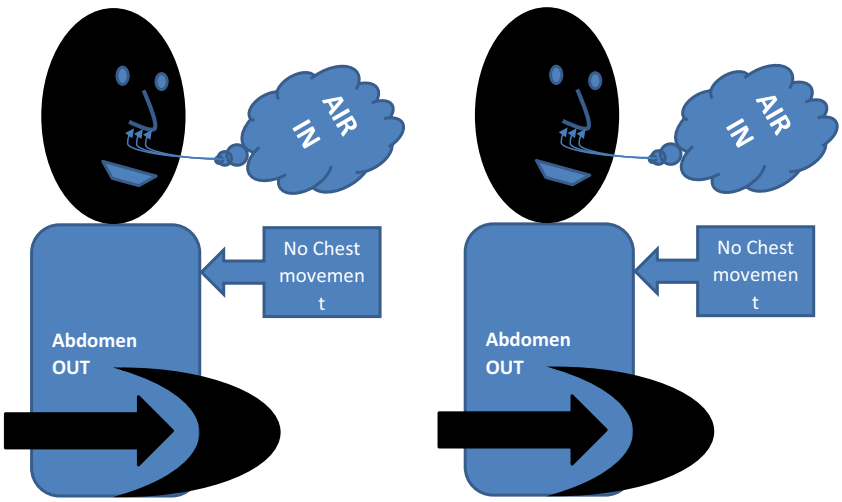

Fig. 2. How to perform diaphragmatic breathing exercises

compared with 26% during the placebo period. [1•] Common side effects of baclofen include (but not limited to) drowsiness, dizziness, lightheadedness, nausea, and muscle weakness. [28] Diaphragmatic breathing techniques are recommended as initial treatment option prior to initiating pharmacologic therapy. [2••] Studies comparing diaphragmatic breathing exercise to baclofen treatment are limited. Another pharmacological therapy that has shown some benefit is the antipsychotic levosulpiride, a selective dopamine D_2-receptor antagonist with prokinetic activity, improved symptoms in 38% of patients with rumination in combination with supportive psychotherapy. [29]

Surgical treatment has been scarcely mentioned in literature for treatment of rumination syndrome. Those that present with low basal LES pressure on HREM with evidence of GERD based on 24-h pH impedance testing may benefit from Nissen fundoplication refractory to behavioral and pharmacological therapy. [30] However, prior studies of patients with rumination syndrome included patients who reported ongoing symptoms despite having undergone fundoplication. Thus, the role for fundoplication surgery or subtotal gastrectomy in rumination syndrome remains uncertain. More research is needed from a surgical standpoint to reaffirm its benefits for rumination episodes.

Conclusion

Rumination syndrome is effortless regurgitation of ingested food that can result in significant functional impairment. It has been shown to be present in patients without underlying psychiatric conditions, and likely underrecognized in clinical practice. Diagnosis is primarily clinical though objective testing such as HREMI and ambulatory 24-h pH impedance testing is helpful. Treatment is focused on behavioral modifications with diaphragmatic breathing exercise as first line. Failure to improve with this should prompt for referral to behavioral health consultants to address barriers. Subsequently, pharmacological therapy with baclofen then levosulpiride can be trialed after ruling out contraindications for use and discussing risks and benefits with patients. Should all those therapies fail, surgical evaluation should be considered judiciously for

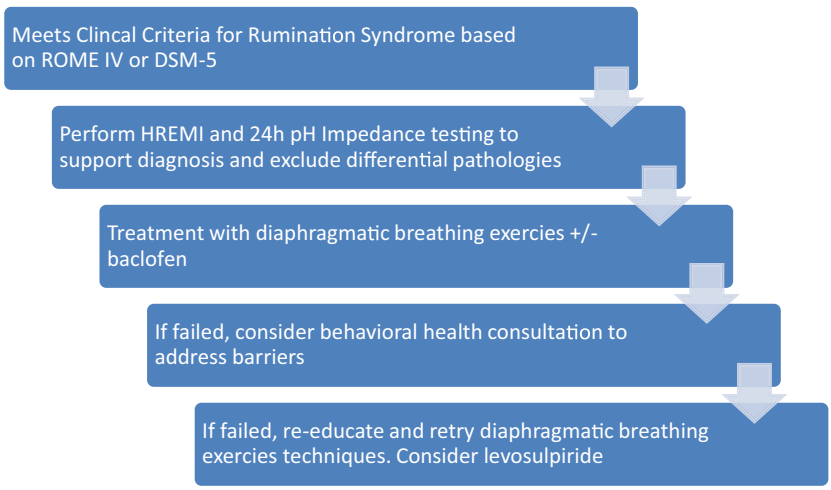

Fig. 3. The recommended approach to diagnosis and management of rumination syndrome

patients with low resting LES pressure and evidence of GERD on 24-h pH impedance testing. Figure 3 illustrates diagnostic and treatment algorithm for rumination syndrome.

Compliance with ethical standards

Conflict of interest
Herit Vachhani, Bruno De Souza Ribeiro, and Ron Schey declare no conflict of interest.

Human and animal rights and informed consent
This article does not contain any studies with human or animal subjects performed by any of the authors.

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