

# The rumination syndrome in adults: A review of the pathophysiology, diagnosis and treatment

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## ABSTRACT

Rumination in adults is considered to be the effortless regurgitation of recently ingested food into the mouth, followed by either rechewing and reswallowing or expulsion of the regurgitate. On the basis of the definition of rumination as a unique category of functional gastroduodenal disorders, according to the newly established Rome III classification, a review of the pathophysiology, diagnosis and treatment of the rumination syndrome in adults is presented after systematic and critical approach of all articles that could be retrieved through PubMed using the term "rumination".

**KEY WORDS:** Impedance, manometry, Rome III classification, rumination

Rumination is not an uncommon phenomenon among animals; it is normally observed in ruminant animals such as cattle, sheep and goats, resulting in improved digestibility of ingested material. Nevertheless, such a behavior is always considered pathologic in humans.

The rumination syndrome is considered to be a functional gastroduodenal disorder that has been recognized as a unique category according to the recently established Rome III criteria (category B4) [Table 1].<sup>[1]</sup>

Rumination is defined as the effortless regurgitation of recently ingested food into the mouth, followed by either rechewing and reswallowing or expulsion of the regurgitate.<sup>[2]</sup> Despite that rumination has been initially described in children and

developmentally disabled adults, it is currently recognized to refer to both males and females of all ages and cognitive abilities.<sup>[3]</sup>

Individuals with rumination syndrome are often misdiagnosed or undergo extensive and invasive testing before reaching diagnosis. This is due to insufficient awareness of the clinical features and also due to the broad spectrum of clinical symptoms that blur diagnosis. The syndrome is frequently confused with bulimia nervosa, gastroesophageal reflux disease and upper gastrointestinal motility disorders, including gastroparesis and chronic intestinal pseudo-obstruction.

Although there is no definitive therapeutic protocol for this condition, reassurance and education of the patient and the family are crucial first steps followed by behavioral and relaxation programs.

The aim of the present review is to describe the underlying epidemiology, pathophysiologic mechanisms, clinical features, modern diagnostic tools and the currently available therapeutic approaches of the rumination syndrome in adults after systematic and critical approach of all articles that can be retrieved through PubMed using the term "rumination".

## Epidemiology

The syndrome has been described in almost equal prevalence among mentally retarded infants (6-10%) and in institutionalized

**Table 1: Functional gastroduodenal disorders (Group B of functional gastrointestinal disorders according to Rome III classification)<sup>[1]</sup>**

B1. Functional dyspepsia
Postprandial distress syndrome
Epigastric pain syndrome
B2. Belching disorders
Aerophagia
Unspecified excessive belching
B3. Nausea and vomiting disorders
Chronic idiopathic nausea
Functional vomiting
Cyclic vomiting syndrome
B4. Rumination syndrome in adults

mentally retarded adults (8-10%).<sup>[4,5]</sup> The syndrome is now recognized with augmenting prevalence among adults of normal mental capacity. Nevertheless, the diagnosis is still delayed; in a tertiary referral center patients had suffered from this condition for 2.75 years and on average had consulted five physicians before reaching correct diagnosis.<sup>[6]</sup>

The overall clinical impression derived from the existing small series of patients, is that rumination is a rare condition that affects more commonly women than men.<sup>[1]</sup> Nevertheless, careful investigation of the epidemiology of rumination is requested to define its incidence and severity in the general population.

### Pathophysiology

Although early studies supported that rumination is an involuntary learned behavior during childhood, current evidence suggests that symptoms may be attributed to altered lower esophageal sphincter and gastric fundus imbalances.<sup>[7,8]</sup> In the study of Thumshirn *et al.*, a barostatically controlled gastric bag along with esophageal manometry were used to compare gastric sensory motor functions and lower esophageal sphincter (LES) relaxation to gastric distention in 12 patients with rumination syndrome and 12 controls. During bag distensions, patients experienced greater nausea, bloating and aggregate score but not pain, compared with controls ( $P < 0.05$ ). At 4 and 8mmHg gastric distension, LES tone reduction was greater in patients than in controls ( $P < 0.05$ ). Gastric compliance, accommodation to a standard meal and response to glucagon were not different in patients and controls. However, half of the patients revealed no gastric accommodation; the latter patients had significantly greater pain perception during distension ( $P < 0.05$ ), but normal somatic sensitivity compared with healthy controls. Moreover, intravenous glucagon induced gastric relaxation in all participants; this suggests that an intrinsic muscle disorder is unlikely to have contributed to the absence of the gastric accommodation postprandially.<sup>[9]</sup>

More recently, the introduction of single-photon emission computed tomography (SPECT) in the study of gastric accommodation and emptying in patients with rumination syndrome, showed that the postprandial to fasting gastric volume ratio and the postprandial change in gastric volume were not significantly different from healthy controls.<sup>[10]</sup>

An open question remains whether the rumination syndrome is a psychiatric disorder or a manifestation of a physiological disturbance. In the Diagnostic and Statistical Manual of Mental Disorders,<sup>[11]</sup> rumination is classified exclusively under the category "eating disorders of infancy". An association between rumination and bulimia nervosa has been described<sup>[12]</sup> and rumination has been recognized as a collateral behavior disorder among these patients. Eating behavior, mood, body perception and disturbances in neurohormonal function have been linked to alterations in metabolism of several monoamines and endogenous opioids in diseases that are related with rumination syndrome, such as bulimia, bulimarexia and anorexia nervosa.<sup>[13-16]</sup> Whether similar neurohormonal changes are present in the rumination

syndrome is unknown and needs further investigation. However, there is increasing evidence that endogenous monoamines alter gastric mechanosensory function through  $\alpha_2$ -adrenergic receptors and 5HT<sub>1D</sub> receptors.<sup>[17,18]</sup>

There may be some factors that seem to precipitate this disease. Amanarth *et al.* reported that rumination appeared to occur after an acute illness in eight of their 12 patients.<sup>[19]</sup> Levine *et al.* noted that psychiatric aspects probably play a role in the syndrome.<sup>[20]</sup> In the study of Soykan *et al.*, nine of 16 patients had the history of minor or major surgery and 67% of these nine patients reported that their symptoms started postoperatively; this could imply that a stressful situation could have been present, but there is no direct indication that the surgery *per se* had any specific effect. In this study, five patients had psychiatric disturbances and four patients had a history of precipitating events such as loss of a family member or a professional setback.<sup>[21]</sup>

The pathophysiology of rumination remains obscure. All available data support the hypothesis of an adapted belch reflex that overcomes the resistance to retrograde flow provided by the lower esophageal sphincter.<sup>[9,22]</sup> In several patients, there is evidence of possible pathological esophageal reflux, as pH monitoring indicates >4% of time with intraesophageal pH below 4.

### Clinical Symptoms and Differential Diagnosis

The clinical presentation of the ruminant individuals includes in many cases additional less specific symptoms, which are not considered as criteria in Rome III classification, such as nausea, heartburn, abdominal discomfort, diarrhea and constipation. Thus, many patients with rumination, in whom such symptoms prevail, are misdiagnosed as suffering from other functional gastroduodenal disorders or gastroesophageal reflux or gastroparesis; thus rumination is probably underappreciated. Weight loss is another rather prominent feature, especially in adolescents; whether weight loss can be directly attributed to rumination or it is secondary due to depression that interlinks with rumination is not clear.

Because the documentation of rumination is difficult, it has been suggested that rumination is a clinical diagnosis. However, documentation of this statement with objective methods might be crucial for a persuasive diagnosis.

The proposed diagnostic criteria, according to Rome III classification, are described in Table 2.<sup>[1]</sup> Typical symptoms include the effortless, repetitive regurgitation of gastric contents, containing partially recognizable material of pleasant taste, shortly after the start of a meal for a period of up to 1-2h. The latter is in contrast with vomiting in the later postprandial period in patients with gastroparesis. In many cases, a brisk voluntary contraction of the abdominis rectus is observed immediately before regurgitation. Sometimes, a sensation of belching precedes the regurgitation or the arrival of the food in the level of pharynx, but neither retching nor nausea is experienced in that period. Once the regurgitant reaches

**Table 2: Diagnostic criteria of rumination syndrome according to Rome III classification<sup>[1]</sup>**

A.	Obligatory criteria (Present for the last three months with onset at least six months before diagnosis)
1.	Persistent or recurrent regurgitation of recently ingested food into the mouth with subsequent spitting or remastication and swallowing
2.	Regurgitation is not preceded by retching
B.	Supportive criteria
1.	Regurgitation events are usually not preceded by nausea
2.	Cessation of the process when the regurgitated material becomes acidic
3.	Regurgitant contains recognizable food with a pleasant taste

the oropharynx, swallowing or vomiting relies upon a totally conscious decision of the patient, usually depending on the social circumstances.

An association between rumination and bulimia nervosa has been proposed.<sup>[22]</sup> Nevertheless, bulimic patients induce vomiting intentionally and seldom reswallow food.

### Documentation

Documenting rumination has been challenging. In a recent article, in 147 children and adolescents, Chial *et al* suggest that the diagnosis of the rumination syndrome should be established solely on the basis of clinical criteria; they deemed testing as unnecessary and too invasive.<sup>[23]</sup>

The characteristic manometric pattern described by Amarnath *et al* in patients with rumination is limited to recordings from within the esophagus, not documenting simultaneous increases in intra-abdominal pressure.<sup>[19]</sup> The complex assembly used by Shay *et al* to document rumination consisted of an esophageal manometry catheter, two pH catheters for pharyngeal and esophageal monitoring, an abdominal pneumograph and a rectal balloon.<sup>[24]</sup> The resources required for this assembly and patient acceptance limit the feasibility of this method. Gastrointestinal manometry and esophageal pH are limited to the detection of acid reflux episodes,<sup>[22]</sup> whereas almost half of reflux episodes in the postprandial period are nonacid.<sup>[25]</sup>

Finding acid in the esophagus during meals, as suggested by Malcom *et al*, is inaccurate, because the changes in pH during meals are more likely due to food constituents with pH less than 4 rather than representing reflux episodes.<sup>[2]</sup>

Recently, Tutuian *et al* described a new method of documenting rumination by using the technique and advantages of combined multichannel intraluminal impedance and manometry (MII-EM).<sup>[26]</sup> Combined MII-EM allows simultaneous evaluation of pressure changes and bolus movement within the esophagus based on changes in intraluminal resistance to alternating current induced by presence of rich ionic materials (i.e., gastric regurgitate) within the esophagus. The probe is a nine-channel combined MII-EM probe with pressure channels and impedance measurement segments 5 cm apart. The most distal pressure sensor is placed within the stomach, the second most distal in

the lower esophageal high-pressure zone and the three most proximal sensors at 5, 10 and 15 cm above the lower esophageal sphincter. As abdominal wall contractions are required in patients with rumination to induce regurgitation, the usefulness of this test is limited if the patient does not make the necessary maneuvers during the test period.

### Treatment

The most efficacious treatment of this syndrome is unclear. Medications (including PPIs) are of no proven value.<sup>[27]</sup> Reassurance, explanation and behavioral therapy are currently suggested for all adolescents and adults of normal intelligence suffering from rumination syndrome. The suggested behavioral intervention relies on habit reversal by the use of diaphragmatic breathing techniques, which compete with the urge to regurgitate.<sup>[27-29]</sup> In this instance, one cannot perform the target behavior and the competing response at the same time. In the case of rumination, consistent practice of diaphragmatic breathing during rumination effectively eliminates rumination, after proper training in both habit reversal and diaphragmatic breathing.<sup>[23]</sup>

### Conclusion

Individuals with rumination syndrome are often misdiagnosed due to insufficient awareness of the clinical features of the syndrome. Although it has been suggested that rumination is a clinical diagnosis, the recently described MII-EM might increase the ability of clinicians to diagnose this under-recognized condition. Early behavioral therapy is advocated and patient outcomes are generally favorable.

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