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THE EXPERT'S CORNER

Teaching Diaphragmatic Breathing for Rumination Syndrome

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INTRODUCTION

Rumination syndrome is one of the least understood functional upper gastrointestinal disorders. The clinical symptoms are primarily characterized by recurrent regurgitation of recently ingested food into the mouth; it is not the same as projectile vomiting, although often the patient describes the symptom incorrectly as vomiting. Early clinical reports of rumination were in children and adults with developmental delays or mental retardation, but this entity is becoming increasingly recognized in otherwise healthy children, adolescents, and adults (1–4). Many gastroenterologists are unaware of, or are reluctant to make the diagnosis of, rumination syndrome, but this can be done readily by history taking (1, 3). In addition, most gastroenterologists are not aware that a simple behavioral approach to treat this disorder exists and can be taught to patients in the office. The purpose of this review is to highlight some of the clinical features of rumination syndrome and to provide practical instruction on habit reversal by diaphragmatic breathing, a relatively easily taught maneuver that can alleviate regurgitation.

Case Presentation

An 18-yr-old man presented with a 2-yr history of symptoms of recurrent regurgitation of food that occur shortly after eating. He regurgitates within 5 min of beginning food ingestion, and also regurgitates after completing his meal. He rarely has regurgitation of fluid that is unrelated to meal intake. He states that the regurgitated food tastes the same as when he ate it. He describes reswallowing the food when the social context does not permit him to spit it out. He notices his symptoms are not worse with any particular food. He can also regurgitate at will. His parents have repeatedly complained to him about his noticeably foul smelling breath. He has occasional heartburn but no abdominal pain or nausea. He states that he feels full fast when eating. He denies any history of weight loss or bulimic behavior, and does not desire to lose weight. His past medical history is significant for a history of gastro-esophageal reflux as an infant and young child. His gastro-esophageal reflux disease (GERD) symptoms appeared to resolve at 5 yr of age, and all gastric acid blocking medication was then ceased. His physical examination is unremarkable other than for multiple dental fillings.

He has seen multiple medical providers who gave different diagnoses. He has been previously shown to have a normal upper endoscopy, upper gastrointestinal and small bowel follow-up barium study, and computed tomography scan of the head and abdomen. He has not responded to repeated trials of acid blocking medication or metoclopramide. His last provider recommended consultation with a general surgeon to undergo a Nissen fundoplication to prevent severe gastro-esophageal reflux.

At his appointment he was instructed on rumination syndrome and diaphragmatic breathing by the clinician. This instruction was reinforced on two separate visits with a behavioral psychologist, and he had a marked improvement in his symptoms of regurgitation at 2 months' follow-up.

Recognizing Rumination Syndrome

The physiological mechanism for rumination syndrome was described by Shay *et al.* (5) and includes (1) forward extension of the head to open the upper esophageal sphincter and (2) a contraction of the abdominus rectus muscles to force gastric contents up through the esophagus and into the mouth. Gastric and esophageal physiologic phenomena surrounding the event of regurgitation in patients with rumination have also been described. Tutuian *et al.* demonstrated an increase in the abdominal pressure preceding the relaxation of the lower esophageal sphincter and the regurgitation event (6). Thumshirn *et al.* demonstrated that lower esophageal sphincter relaxation occurred at a lower pressure of gastric distention in patients with rumination compared with controls (7). These studies suggest that learned anticipation or possibly hypersensitivity to the sensations associated with food in the stomach causes the individual with rumination syndrome to contract the abdominal wall, opening the lower esophageal sphincter and upper esophageal sphincter with cessation of esophageal body peristalsis, prior to a regurgitation event. This sequence of behaviors usually occurs in a controlled

fashion and does not result in projectile vomiting. It is a voluntary, learned habit which patients are frequently unaware they are performing. Although it is possible to record the abdominal wall contraction, which is key to regurgitation and rumination using either a nasogastric motility catheter or abdominal wall electromyographic sensors, this is rarely done because the diagnosis can be made by symptom criteria alone.

The criteria for children and adults with rumination disorder have been described (Table 1) (8, 9). Clinical features of regurgitation are similar to a variety of other disorders such as bulimia nervosa, GERD, dyspepsia, and other upper gastrointestinal motility disorders such as gastroparesis and chronic intestinal pseudo-obstruction. Children and adults with rumination syndrome frequently undergo multiple medical evaluations and experience prolonged symptoms before a diagnosis (1–4). This likely reflects the under-recognition of this disorder in the medical field.

One important aspect in the history is the timing of the regurgitation. In a review of patients, O'Brien *et al.* reported that most adolescent and adult patients had symptoms of regurgitation within 10 min after starting eating (3). This finding has been confirmed in other independent observational studies of adults and adolescents with rumination syndrome (4). This is in contrast to conditions such as GERD and gastroparesis in which regurgitation occurs 1 h or greater after meal intake. When asked, patients with rumination syndrome frequently state that the regurgitated food tastes the same as when ingested. O'Brien *et al.* reported that patients with rumination syndrome describe the taste of the regurgitant as lacking an acidic, bitter, or sour taste (3).

Another clinical feature is the lack of pain or discomfort related to the regurgitation (1–4). Patients rarely report heartburn, nausea, retching, or chest pain (1–4). Most studies evaluating patients do not demonstrate endoscopic evidence of severe esophagitis (1–4). Weight loss has been described in patients with rumination syndrome (1). Patients suspected of eating disorders should be evaluated by a psychiatrist as there are case reports of the cooccurrence of bulimia nervosa and rumination syndrome (1). The past history of GERD in early childhood reflects evidence that rumination syndrome may be an unconsciously learned habit as a consequence of a primary ongoing or resolved disorder such as GERD, functional vomiting, or bulimia nervosa.

Figure 1. Illustration of diaphragmatic breathing technique. The individual is instructed to take inspiratory and expiratory breaths with the abdominal muscles, keeping the chest motionless. This behavior is incompatible with abdominal wall contraction, which is a precipitating behavior for regurgitation in rumination syndrome. Drawing provided by Miranda van Tilburg, Ph.D.

Table 1. Rome III Diagnostic Criteria for Rumination Syndrome

A. Adult Rome III Criteria (9) for Rumination Syndrome
Must include both of the following:
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.

*Criteria fulfilled for the last 3 months with symptom onset at least 6 months before diagnosis.

B. Adolescent Rome III Criteria for Rumination Syndrome (8)
Must include all of the following:
1. Repeated painless regurgitation and rechewing or expulsion of food that
   a. Begin soon after ingestion of a meal
   b. Do not occur during sleep
   c. Do not respond to standard treatment for gastroesophageal reflux
2. No retching
3. No evidence of an inflammatory, anatomic, metabolic, or neoplastic process that explains the subjects symptoms.

*Criteria fulfilled for the last 3 months with symptom onset at least 6 months before diagnosis.

Treating Rumination Syndrome

Medications are of no proven value in the treatment of rumination. In a case series of five patients that were refractory to behavioral interventions, Nissen fundoplication has been used to treat rumination (10). All five had complete cessation of rumination after surgery (10). Long-term follow-up and postprocedure complications in these patients were not reported; however, anecdotal clinical experience of the authors

suggests that potential complications of fundoplication include retching, gas-bloat syndrome, and gastroparesis.

Abdominal wall contraction is thought to be the precipitating event in rumination syndrome (1, 3). Targeting abdominal wall contraction by teaching diaphragmatic breathing may help the patient with rumination unconsciously relax their abdominal muscles during eating; the time when regurgitation occurs most frequently. Diaphragmatic breathing has been shown to be clinically beneficial in rumination syndrome. Wagamen *et al.* describe using diaphragmatic breathing to treat a child as young as 6 yr old with rumination syndrome (11). This patient experienced a gradual decrease in rumination events until none approximately 3 months after learning treatment (11). In an open labeled trial Prather *et al.* examined the effect of diaphragmatic breathing in 15 adolescents and adults with rumination syndrome (12). Ten reported a complete response, and three had greater than 50% reduction in regurgitation episodes (mean follow-up of 16 wk) (12). At a different medical center, Soykan *et al.* reported subjective improvement in five adult patients with rumination syndrome using a combination of breathing techniques and progressive muscle relaxation (4). In a retrospective study, Chial *et al.* reported the outcomes of 46 patients who underwent behavioral treatments with diaphragmatic breathing and other techniques (1). Each patient underwent a median of one treatment session (range 1–19) (1). Overall symptoms resolved in approximately 30% and improved in 56% (13% reported no improvement at the time of follow-up: mean duration 10.2 ± 1.4 months) (1). Most clinicians do not have access to a therapist knowledgeable in teaching diaphragmatic breathing for rumination syndrome. However, diaphragmatic breathing is easy to learn and can be demonstrated during a regular clinic visit in the physician's office.

How Diaphragmatic Breathing Is Taught

Patients are asked to sit or lay in a relaxed position. Because most individuals with rumination regurgitate during meal time, practicing the method while sitting is preferred (Fig. 1). One hand is placed on the upper chest and one hand on the abdomen just below the rib cage at the bottom of the sternum. Patients are initially instructed to take a deep inspiratory breath. This is to demonstrate to the patient that they usually breathe with their chest. The hand on the chest will move while the hand on the abdomen is relatively still. The patient is then instructed to take breaths by only moving the abdomen, and keeping the chest motionless. The goal is to keep the hand on the chest almost still, while the hand on the abdomen rises and falls with the diaphragmatic breath. Each breath inhalation or exhalation should be slow and last at least 3 s. Emphasis should be placed on increasing abdominal displacement and breathing out slowly and completely. This will ensure that inhaling is natural and effortless. In order to enhance slow breathing, patients can purse their lips so they exhale through a small opening and/or use imagery such as blowing up and deflating a balloon in their abdomen.

Patients should be encouraged to practice diaphragmatic breathing midway through the meal (if regurgitation occurs during the meal) or after meals for three different 5 min periods of inactivity with 10 min in between periods (11). They should also repeat this maneuver after each episode of regurgitation. The goal is for diaphragmatic breathing to occur unconsciously during events that may precipitate regurgitation.

It is important for both a clinician and their patient to realize that diaphragmatic breathing may feel very awkward at first. A patient may believe that "correct" breathing should not take this much effort. It is important to anticipate and address these concerns so that a patient realizes that with practice breathing will become easier and more effortless. Sometimes patients may feel "fat" by pushing their abdomen out and/or wear clothing that is too restrictive to allow for abdominal distention. Patients should be encouraged to wear loose fitting clothes and loosen their belts before starting diaphragmatic breathing, and body image concerns should be addressed for this technique to be successful.

Patients also need to become aware of when rumination occurs during the day. It is recommended for a patient to keep a notebook of when symptoms occur, for what duration, and associated with the kind of meal. A patient needs to be instructed on how the technique is helpful to increase adherence. It is important to explain to the patient that rumination is precipitated by an involuntary habit, usually contraction of the abdominal and diaphragmatic muscles, and diaphragmatic breathing is a maneuver that is incompatible with this maneuver (*i.e.,* it involves habit-reversal).

Clinicians who teach diaphragmatic breathing to patients should stress the importance of continued practice for success. With practice, this maneuver should become an unconscious behavior that occurs during and after eating. These techniques can be taught by the clinician in the office. However, if this method is unsuccessful, further instruction and reinforcement of diaphragmatic breathing should be sought from a behavioral psychologist.

CONCLUSION

Although the symptoms of regurgitation are similar to those of other functional upper gastrointestinal disorders, the medical presentation of rumination syndrome is distinct. The timing of the regurgitation, accompanying symptoms, along with the symptom based diagnostic criteria are helpful clinical features that differentiate rumination syndrome from GERD, bulimia, dyspepsia, and gastroparesis. Rumination syndrome is associated with a series of esophageal and gastric physiologic events that facilitate regurgitation in response to abdominal wall contraction (6, 7). Diaphragmatic breathing is a technique that clinicians can teach patients as a first approach toward reversing the habit of abdominal wall contraction, which may alleviate symptoms of regurgitation associated with rumination syndrome.

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