



Chronic Burping and Belching

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Abbreviations *SGB* Supragastric belching · *GB* Gastric belching · *UES* Upper esophageal sphincter · *LES* Lower esophageal sphincter · *TLESR* Transient lower esophageal sphincter relaxation · *GERD* Gastroesophageal reflux disease · *CBT* Cognitive behavioral therapy · *AET* Acid exposure time · *GABA* Gamma-aminobutyric acid · *LTF* Toupet fundoplication

Abstract

Belching is a physiological event that allows venting of swallowed gastric air. Excessive belching is a common presentation to gastroenterology clinics and could be isolated complaints or associated with other gastrointestinal problems.

Purpose of this Review It is to describe the presentation, diagnosis, and treatment of belching disorders

Recent Findings These demonstrate that learned abnormal behaviors in response to unpleasant feeling in the abdomen are the driving causes for excessive belching and addressing these behaviors by speech pathology and cognitive behavior therapy considered as the keystone in its management

Summary The gold standard in the diagnosis of belching is impedance monitoring by which belching is classified into supragastric belching and gastric belching.

Introduction

Belching or eructation is defined as a sudden escape of a gaseous bolus from the esophagus to pharynx which could be audible or silent [1]. It is considered as a physiologic event which normally happens up to 30

times a day [2]. However, excessive belching can become reason for consultation when it is repetitive and interferes with day-to-day activity and affects the quality of life of patients [3]. There is no systematic study on

epidemiology of belching, but in one study, up to 50% of patients with dyspepsia also complained of excessive belching. In this group, belching was interfering with their social life in 20% [4]. It is estimated that

approximately 3.4% of patients referred to tertiary hospitals for upper gastrointestinal problem suffer from supragastric belching [5].

Pathophysiology

There are two different types of belching: supragastric belching and gastric belching. Supragastric belching is considered as an unintentional reaction to unpleasant feeling in the abdomen and/or retrosternal region which does not happen during sleep [6], speech [1, 7], or during patient's distraction [7]. There are two primary mechanisms for supragastric belching which consist of air suction and air injection. In air suction, patients subconsciously contract the skeletal muscle part in the diaphragm which results in negative pressure in the esophagus. In this situation, when the upper esophageal sphincter relaxes, the pressure difference between pharynx and atmosphere results in the rapid inflow of air into the esophagus. Subsequently, the air in the esophagus forces out of the esophagus again during straining which is perceived as belching [1, 8, 9]. In the air injection mechanism of supragastric belching, voluntary contraction of the base of the tongue results in elevated pharyngeal pressure and unchanged esophageal pressure which results in pushing of air from the pharynx to the esophagus. Again, air is expelled from the esophagus during straining. In both mechanisms, air does not enter the stomach; the reason it is called supragastric belching. Although supragastric belching is initially considered as an voluntary response of patients to unpleasant feeling in the upper abdomen or chest, it is through activation of voluntary muscle and over time becomes a firmly established habit in patients. There is not enough evidence to support the cause and effect relation between supragastric belching and psychological disorders such as anxiety and depression, but these conditions are associated with it. Also, supragastric belching results in a significant reduction in the quality of life of patients [3, 10].

Gastric belching occurs with impetuous release of air from the stomach through transient relaxation of the lower esophageal sphincter (TLESR); this is a gastric venting mechanism that prevents excessive abdominal distention by swallowed air [11–13]. It is a physiological mechanism and triggers by gastric extension which happens in average of 30 times in 24 h, more frequently after consumption of carbonated beverages [11]. Gamma-aminobutyric acid, metabotropic glutamate receptors, cannabinoid receptor 1, nitric oxide, and cholecystokinin are neurotransmitters that impact the amount of TLESRs [14–17].

Belching in patients with gastroesophageal reflux disease (GERD)

Proton-pump inhibitors (PPIs) which are commonly used in treatment of GERD symptoms are considered effective in reducing the number of

belches as well [19–22]. Perhaps this can be explained by the notion that PPIs reduce the unpleasant abdominal or retrosternal sensation that triggers the behavior and leads to supragastric belching.

The study with ambulatory impedance monitoring by Hemmink et al. showed that about 50% of patients with GERD also presented with supragastric belches. The mechanism of reflux and its temporal association with supragastric belching revealed two association patterns; 18% of the supragastric belches occurred very soon after acid reflux and responded well to proton-pump inhibitors which treat reflux symptoms. However, in 30% of patients, supragastric belching happened prior to acid reflux. It is believed that supragastric belching in this group triggered the reflux, and these patients did therefore not respond to proton-pump inhibitors [18].

Belching in patient with functional dyspepsia

Belching is a common complaint in patients who are suffering from other functional upper gastrointestinal diseases besides GERD. Conchillo et al. found that patients with functional dyspepsia have more frequent gas reflux symptoms. However, the author does not specifically assess supragastric belching in this small study [21].

Belching and rumination syndrome

Rumination syndrome is defined as a recurrent unintentional regurgitation of recently consumed food. The mechanism of rumination syndrome is the habitual contracture of voluntary abdominal muscle which result in increasing the intragastric pressure which drives gastric contents into the esophagus and higher [23, 24••].

A study by Kessing et al. revealed that supragastric belching could induce rumination in a subgroup of patients with rumination syndrome. In this group, supragastric belching triggers the sharp increase in the intragastric pressure which forces out the gastric content within the esophagus and results in regurgitation of food [25, 26•].

Aerophagia

The term aerophagia is sometimes confused with supragastric belching. In aerophagia excessive air is swallowed and transported to the intestines and colon. Patients complain of bloating and flatulence. There are three major differences between aerophagia and supragastric belching. Firstly, in aerophagia the air is swallowed and transported distally by peristalsis, while in supragastric belching, this is done by air suction or pharyngeal air pushing [8••, 27, 28]. Secondly, in aerophagia the air is mainly found in the intestines and colon, while in supragastric belching, the air stays proximal of the stomach [18]. Thirdly, in aerophagia patients complain of bloating, abdominal distention,

and flatulence, while in supragastric belching, the primary symptom is belching [29].

Clinical evaluation and diagnostic approach

The first step in the clinical evaluation of the patient with excessive belching is a comprehensive history and physical examination. This helps to ensure that red flags for organic disorders, such as weight loss and dysphagia, do not exist and also to better understand the clinical pattern including the frequency and timing of belching [30].

Impedance monitoring is the gold standard in the diagnosis of belching and aerophagia and helps to identify the underlying cause of belching and to differentiate supragastric belching from gastric belching [29, 31]. Impedance allows the presence and movement patterns of air in the esophagus. It helps to study belching by providing objective evidence of supragastric belching events. Intraluminal esophageal impedance monitoring is also helpful in the detection of esophageal transit of fluid boluses and gastroesophageal reflux. Gastric belching is characterized by an increase in impedance level starting in the distal channel and progressing to the most proximal channel (Fig. 1). Criteria for diagnosis of supragastric belching is a rapid antegrade movement of gas (impedance of 1000 Ω), followed by retrograde expulsion back to the baseline impedance level (Fig. 2) [8••]. Up to 13 events of supragastric belching in 24 h have been demonstrated to be physiologic in asymptomatic patients which

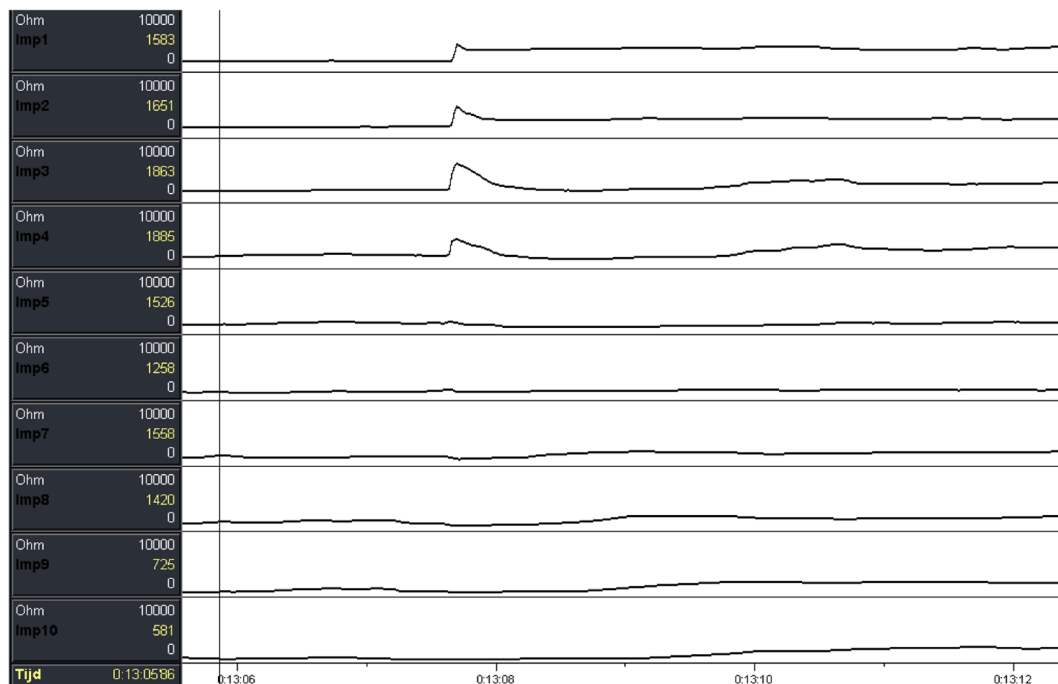


Fig. 1. Gastric belching during liquid reflux episode. In this figure, impedance monitoring shows a decrease in impedance starting distally and moving in proximal direction (blue arrow) and an increase in impedance level starts during the liquid reflux episode spreading in proximal direction

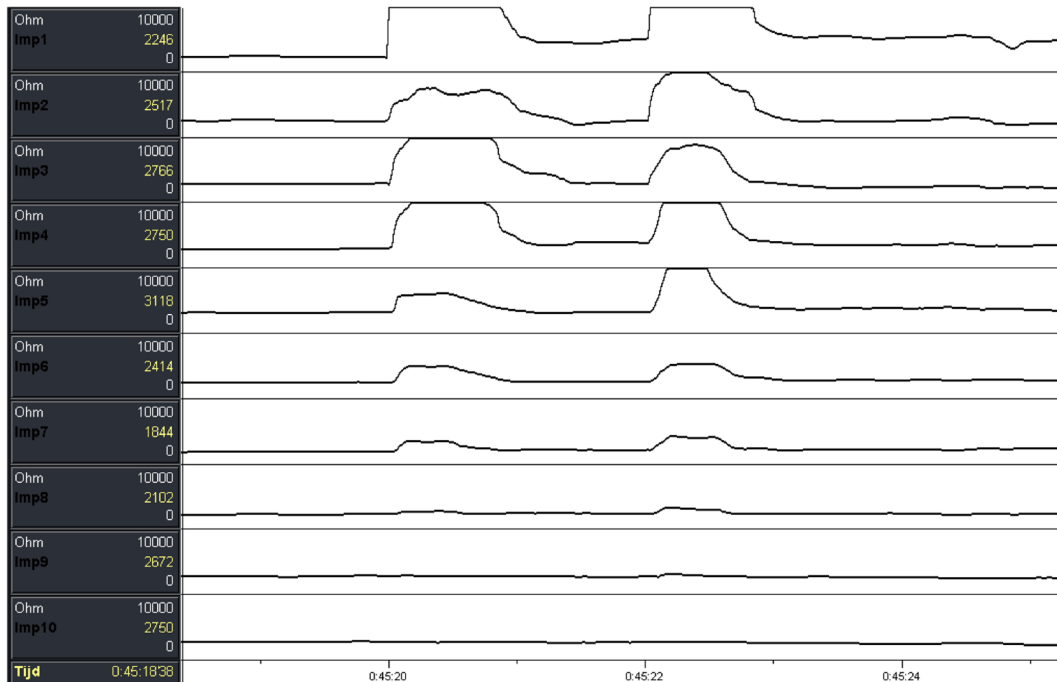


Fig. 2. Supragastric belching. In this figure, the impedance monitoring shows an increase of impedance level from the proximal channel to the most distal impedance channel

considered as an upper limit of normal; we therefore assume this can go unnoticed in healthy subjects as well. Patients with symptomatic supragastric belching have average of 101 events in 24 h (ranging from 7 to 510) which is much higher even when compared to the patients with gastric belching [5]. In another study, on 90-min impedance monitoring, the median number of belching events captured for patients with gastric belching was 1, compared with 36 for those with supragastric belching [9]. This helps experienced gastroenterologist to spot the diagnosis of supragastric belching on a quick overview of impedance monitoring based on characteristic day-time density of symptom markers and impedance “spikes” of intraesophageal air movement, notably absent during sleep [6].

High-resolution manometry (HRM) is not commonly recommended in diagnosis of supragastric belching, but if combined with impedance, monitoring helps to differentiate between supragastric belching, gastric belching, and rumination syndrome. It also allows to distinguish the underlying manometric technique, air suction, or pharyngeal air pushing, although it is not clear if this helps treatment [30].

Treatment of belching

The keystone for treating patients with supragastric belching and gastric belching is a comprehensive clarification of the etiology of these symptoms which makes the patient aware that this is a behavioral disorder. It is often challenging for the patient to accept that there is no pathological explanation for their disease [1]. The most described effective treatment for supragastric belching is behavioral modification known as psychoeducation [32].

Speech therapy is the most described treatment in supragastric belching. A report by Ten Cate et al. on 48 patients revealed 83% of patients with supragastric belching responded well to behavioral modification with a significant reduction of the total median visual analogue scale (VAS) from 406 to 125. In this method, an experienced speech pathologist provided care in ten sessions with average of 60 min for the first three sessions followed by 30 min of training for the remaining sessions. The treatment gives the patients insight into the underlying behavioral problem related to excessive swallowing of air and strategies to tackle it. These strategies include changing the unconscious act of breathing and swallowing to more conscious and purposeful movement by retraining of respiratory muscle with tight glottal/laryngeal contraction and mouth closure, paying more attention to the pathophysiology of supragastric belching and controlling of air influx during breathing. Abdominal breathing was also beneficial in the reduction of belching symptoms. In severe cases, patients were encouraged to retrain their breathing, while they put their finger between their mouth and breath by open mouth [33]. Katzka also described that supragastric belching is not possible when asking the patient to use a pencil between the teeth [34•]. Speech therapy also improves the coordination between the lingual, laryngeal, and cricopharyngeal muscles by relaxation of the maxilla, laryngeal manipulation, and Boone's voice facilitating's maneuver to prevent any unusual movement of the tongue, larynx, and upper esophageal sphincter which cause supragastric belching. The response rate was assessed by VAS which considers the effect of belching on both personal and social life of affected patients and also the degree of patients' control on their symptoms. This technique should be practiced on a daily basis until the patients picks up the new habits. The previous study by Hemmink et al. also confirmed that speech therapy is helpful in patients with supragastric belching. In this study, 6 out of 11 patients had more than 30% improvement in their VAS score, and the rest of them showed some degree of improvement [35]. Speech therapy has been tried differently in different studies. Riehl et al. examined a two-session protocol, based on their pilot study of a psychologist delivering psychoeducation and instructions on relaxed open-mouth breathing. They achieved 75% reduction in symptom at 3 months [32]. Also, one education session on sustained glottal opening showed complete improvement in supragastric belching at 1 month in 80% of patients as demonstrated by Katzka [34•].

Cognitive behavioral therapy (CBT) was also effective in the treatment of supragastric belching as shown in the study by Glasinovic et al. In this interventional study, the severity of symptoms was assessed pre- and posttreatment. The intervention involved five CBT sessions which have three components: a cognitive part, a behavioral component, and an assessment of treatment and outcome. In the first session, patients were separately assessed by gastroenterologist and psychologist, and the contributing psychosocial factors were identified. In the following sessions, the treatment was initiated with a focus on assisting the patient how to recognize the etiology of the disease, triggering factors and explanation of how treatment could improve their symptoms. The critical component of CBT was to recognize the warning signs which most patients described as abnormal tension or uncomfortable pressure-like feeling in the retrosternal area just before the supragastric belching starts. Following this warning sign, they were encouraged to practice awareness training

technique to stop belching with diaphragmatic breathing, mouth opening, and tongue positioning. The patients were assessed based on MII-pH pre- and posttreatment at 8 weeks. Cognitive behavioral therapy resulted in more than 50% reduction in belching symptoms in more than 50% of patients. It was also effective in decreasing the esophageal acid exposure time in the patients with elevated acid exposure time at baseline and declining of mean VAS score from 260 to 140. CBT also decreased the frequency of supragastric belching and associated esophageal acid reflux, but it was not effective in reducing the frequency of gastric belching [36].

A randomized double-blinded placebo-controlled study was performed by Pauwels et al. on the effect of baclofen on 25 patients with supragastric belching and rumination syndrome who did not respond to PPIs [37]. Baclofen is a gamma-aminobutyric acid (GABA) receptor agonist which is commonly used for muscle spasticity and also inhibits TLESRs [38–42]. Regurgitation was the main symptom in 16 patients; belching was predominant in 5. The patients were commenced on 10-mg baclofen, three times a day for 2 weeks, and were then assessed by high-resolution manometry. This study showed that baclofen significantly decreases the number of rumination episodes and the ratio of rumination to straining. However, it was not effective in the treatment of supragastric belching. In patients treated with baclofen, the pressure of postprandial lower esophageal sphincter was considerably higher than the placebo group which resulted in the reduction of the number of rumination symptoms. However, the frequency of postprandial TLESRs was considerably less than the placebo group [37]. Another study on a small number of patients revealed improvement in symptoms and reduction in postprandial flow events in patients with rumination and SBG who treated with baclofen [43].

In a study by Oor et al., upper gastrointestinal endoscopy, esophageal manometry, and 24-h pH impedance were used to compare the effectiveness of different methods of partial fundoplication in controlling reflux symptoms and also post-operation gastric belching and SGB. Two partial fundoplication methods include the laparoscopic 270° posterior or Toupet fundoplication and 180° anterior fundoplication. This study showed that Toupet fundoplication and anterior fundoplication controlled reflux symptoms equally and resulted in a similar reduction in the number of belching and supragastric belching [44].

Conclusion

Belching is a common physiological symptom in general population which can happen isolated or associated with other gastrointestinal complaints such as GERD, rumination syndrome, or functional dyspepsia. Impedance monitoring helped to better understand the pathophysiology of belching and to divide belching to gastric or supragastric belching based on its mechanism.

Psychoeducation is considered as the most effective strategy for treatment of supragastric belching and consists of speech pathology and cognitive behavioral therapy. Baclofen effectiveness in symptoms management varied in different studies, and it is recommended to use baclofen only if other treatment options failed.

Compliance with Ethical Standards

Conflict of Interest

AZ does not have anything to disclose. AJB received research funding from Nutricia, Norgine, and Bayer and received speaker and/or consulting fees from Laborie, EsoCap, Diversatek, Medtronic, Dr. Falk Pharma, Calypso Biotech, Thelial, Robarts, Reckitt Benkiser, Regeneron, Celgene, Bayer, Norgine, AstraZeneca, Ammirall and Allergan.

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