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Unlocking the Burp Reflex: A Review of Retrograde Cricopharyngeal Dysfunction

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Abstract

Introduction: The aim of this review is to synthesize current evidence on retrograde cricopharyngeal dysfunction in light of the rapidly expanding literature, summarizing contemporary knowledge on its pathophysiology, diagnosis, and management. Additionally, this study highlights challenges related to access to diagnostic and therapeutic services and underscores the significant impact of the condition on patients' quality of life.
Materials and methods: A comprehensive review of the literature was conducted using the PubMed and Google Scholar databases using keywords: „retrograde cricopharyngeal dysfunction ", „ R-CPD ", „abelchia ", „ inability to belch ", „ inability to burp", „upper esophageal sphincter", „UES". Citations were also screened in each article for additional sources.
Conclusions: Retrograde cricopharyngeal dysfunction (R-CPD) is an underrecognized condition with a characteristic symptom profile that significantly impairs quality of life and mental health. Its pathogenesis remains incompletely understood. High-resolution impedance manometry provides the most reliable diagnostic approach at this moment. Botulinum toxin injection into the cricopharyngeus muscle is currently the most effective treatment, offering rapid and often long-term symptom relief, with in-office or endoscopic approaches demonstrating comparable results. Further research is needed to refine diagnostics, optimize treatment protocols, and clarify long-term outcomes.
Keywords: retrograde cricopharyngeal dysfunction, R-CPD, inability to belch, inability to burp, abelchia.

1. Introduction

The upper esophageal sphincter (UES) is thought to maintain tonic activity that limits the entry of air into the esophagus during respiration and serves as a protective barrier against the retrograde movement of gastric contents into the pharynx. Nevertheless, transient relaxation of the UES is required to permit physiological processes such as belching and emesis [1]. Retrograde dysfunction of UES refers to a failure of sphincter relaxation for retrograde release of excess swallowed air, which results in an impaired ability to belch, which can substantially compromise patients' quality of life. Common clinical manifestations include abdominal bloating, abdominal and/or retrosternal pain, audible gurgling sensations in the throat and chest and excessive flatulence [2].

The earliest report of symptoms consistent with this disease entity in the literature is attributed to Kahrilas et al. (1987), who described the case of a 25-year-old woman with a long-standing history of severe, episodic chest pain accompanied by gurgling noises in the chest and an inability to belch, despite a pronounced urge to do so during painful episodes [1]. Between 1987 and 2018, only four case reports of this phenomenon were published. A major breakthrough occurred in 2019, when Bastian and Smithson presented the first comprehensive study on the condition, proposing both diagnostic and therapeutic approaches. At that time, the term retrograde cricopharyngeus dysfunction (R-CPD) was proposed [3]. Since then, a growing number of studies have been published, drawing particular interest from specialists in otolaryngology and gastroenterology. Knowledge of this condition has been expanding rapidly.

2. Epidemiology

Precise epidemiological data on R-CPD are currently unavailable. Nevertheless, analysis of published case series allows certain demographic patterns to be inferred. Available evidence suggests that R-CPD predominantly affects young individuals. In the earliest larger cohort reported by Bastian and Smithson, 51 patients were described, with a male-to-female ratio of 30:21 and an age range of 16–63 years (mean age 30 years) [3]. Subsequent studies have reported comparable demographic characteristics, including a study of 72 patients, male-to-female ratio of 50:22 with a mean age of 30 years (range 18–68 years) [4], as well as a series of 200 patients in whom ages ranged from 9 to 64 years, with an average age of 31 years and a near-equal male-to-female ratio (105:95)[5]. Cases of R-CPD have also been reported in children. In 2022, Hoffman et al. described a series of five pediatric patients with the condition [6].

Collectively, these data indicate that R-CPD is most commonly recognized in young adults, while also affecting a broad age range. The prevalence in males and females appears to be similar.

3. Pathogenesis:

The pathogenesis of this disorder is not yet fully understood. Although the underlying mechanism has been described by multiple authors. Additional contributing factors continue to be identified.

Relaxation of the UES is expected to occur during belching. In patients with retrograde cricopharyngeal dysfunction, however, this mechanism is impaired. Manometric assessment has demonstrated an absence of UES relaxation in response to gastroesophageal gas reflux, often accompanied by a paradoxical increase in UES pressure. During episodes of

gastroesophageal gas reflux, a characteristic sequence of physiological events has been observed. Air ascends retrogradely from the stomach into the esophagus, followed by a rise in intraesophageal pressure reaching levels comparable to gastric pressure. Rather than relaxing, the upper esophageal sphincter demonstrates sustained or increased pressure, preventing effective venting of gas into the pharynx. As a result, esophageal clearance occurs through secondary peristaltic activity, which returns the trapped air back to the stomach [4,7,8]. In addition, Yousef et al. (2024) employed high-resolution impedance manometry to compare 13 patients with R-CPD and 29 asymptomatic controls. Their analysis demonstrated that R-CPD is associated with increased UES length, higher basal UES pressure, and a greater frequency of ineffective esophageal motility [9]. This is consistent with the assumption proposed by Bastian in 2019, suggesting that long-term esophageal changes from R-CPD (dilation, damage) might lead to problems with esophageal movement [3].

Another finding relevant to the discussion of R-CPD pathogenesis relates to lower esophageal sphincter function. A trend toward reduced basal LES pressures compared with control groups has been observed, which may allow recurrent retrograde passage of gastric air into the esophagus [10].

Several hypotheses have also been proposed regarding the etiology of R-CPD. Gastroesophageal reflux disease (GERD), laryngopharyngeal reflux (LPRD), and genetic factors have been proposed as potential contributors to the pathogenesis of R-CPD. It has also been suggested that the autonomic nervous system may represent an intriguing point of investigation in uncovering the etiology of R-CPD [11]. Chen et al. reported the results of a survey conducted among 199 respondents recruited from the Reddit community "r/noburp," which has approximately 26,000 members. The survey revealed that the majority of respondents indicated that they had no other gastrointestinal conditions but 55 participants reported a diagnosis of GERD. Interestingly, 43 participants reported that a family member had experienced similar symptoms [12].

Despite growing insight, the underlying mechanisms responsible for the inability to belch remain incompletely defined, highlighting the need for continued investigation to fully elucidate the pathogenesis of this condition.

4. Clinical presentation

The hallmark symptom of R-CPD is the inability to belch, which subsequently leads to air trapping and a cascade of secondary effects. The vast majority of patients report that they have never been able to belch, or have managed to do so only a few times in their lifetime [1,3,13,14]. Most patients report experiencing symptoms every day [12].

The most burdensome and commonly reported symptom is pain involving the lower throat, chest, abdomen, and back. Patients frequently describe this pain as sharp in character or as a sensation of pressure in the chest. It is typically absent in the morning and progressively intensifies throughout the day, particularly after meals. Intense episodes of chest or throat pressure are often associated with a feeling of choking and difficulty achieving a full inspiration [1,3]. In the study by Hoesli et al., which included 200 patients, participants rated the severity of their symptoms on a 7-point scale, with 7 indicating very severe symptoms, and the median score reported was 6 [5].

Another prominent and burdensome symptom reported by the majority of patients is bloating. Patients noted that their abdomen visibly distended as the day progressed [3]. In a case reported by Xie et al. (2022), a 19-year-old man had experienced flatulence since birth, which worsened when he cried and, in some instances, even led to vomiting [15].

Theoretically in R-CPD, the upper esophageal sphincter fails to allow retrograde passage of gas from the stomach. This leads to air trapping in the esophagus and the production of

characteristic gurgling sounds in the chest and/or lower neck. Patients have described these noises in vivid terms, including “frogs croaking,” and “dinosaur noises”[3].
Less frequently reported manifestations include troublesome and painful hiccups, nausea, excessive salivation as well as exertional dyspnea, difficulty vomiting and globus [2,9,16,17].

Symptoms are often exacerbated by the consumption of spicy or greasy foods and carbonated drinks, which patients describe as provoking increased pain and pressure [4,13,14].
Some patients report transient symptom relief when lying either supine on their back or in the left lateral position, which may facilitate distal movement of gas through the gastrointestinal tract, resulting in increased passage of flatus [1,4,13,14].
In children, the clinical presentation of retrograde cricopharyngeal dysfunction closely resembles that observed in adults [6]. Sato et al. (2018) reported the case of a 17-year-old girl whose symptoms worsened while sitting at a school desk and during physical exertion [14].

5. Diagnosis

5.1 Manometry

Esophageal manometry is a widely used diagnostic modality in the evaluation of retrograde cricopharyngeal dysfunction. It was already employed in the first reported case from 1987, in which no relaxation of the upper esophageal sphincter was observed in response to esophageal air injections [1]. As understanding of R-CPD has expanded and additional studies have emerged, successive modifications and refinements of manometric techniques have been proposed to better characterize this disorder.
Manometry reveals impaired relaxation of the upper esophageal sphincter in response to retrograde gas flow and elevated basal pressures of the UES can be observed. A greater proportion of individuals with R-CPD exhibit ineffective esophageal motility compared with asymptomatic subjects [7,9].
The integration of impedance sensors into esophageal manometry catheters enables simultaneous evaluation of intrabolus pressure and bolus transit alongside manometric parameters, a technique referred to as high-resolution impedance manometry (HRIM) [18].
In the study by Renske A.B. Oude Nijhuis et al. (2021), HRIM was performed after patients ingested carbonated water. During the procedure, participants experienced symptoms characteristic of R-CPD, and manometric recordings revealed gastroesophageal gas reflux events. Notably, none of these events triggered relaxation of the upper esophageal sphincter. Instead, an increase in UES pressure was observed [7]. Following the mentioned study, an increasing number of researchers have begun incorporating carbonated beverage challenges into the diagnostic evaluation of R-CPD and reporting their findings [8,10,19,20]. Evidence from these publications suggests that this test is highly promising.

The most recent and comprehensive study to date on this method, representing the first large-scale investigation of manometry combined with a carbonated beverage provocation test including a control group, was published by Raymenants et al. (2026), marking a breakthrough in the assessment of R-CPD. Following a provocation test, high-resolution impedance manometry revealed that 34.5% of symptomatic patients demonstrated normal peristalsis, 54.5% showed ineffective esophageal motility (IEM), and 11% exhibited absent peristalsis (AP), highlighting the utility of this provocative maneuver in characterizing esophageal motility abnormalities in R-CPD. The study also observed a trend toward lower basal lower esophageal sphincter (LES) pressures compared with control groups, as well as manometric evidence of a hiatal hernia in 33% of patients.Furthermore, air oscillations were observed more frequently in patients with R-CPD than in controls [10].

Based on this pioneering study, several findings have emerged that may significantly aid in the diagnosis of R-CPD. The presence of air oscillations can support the diagnosis, demonstrating a specificity of 84%, although their absence does not exclude the condition, with a sensitivity of 53%. Notably, when a belch is accompanied by a UES pressure greater than 18 mmHg in conjunction with air oscillations, diagnostic specificity increases further to 93% [10].

5.2 24-h pH-impedance monitoring

Prolonged episodes of sustained high impedance, indicative of air entrapment, have been documented during 24-hour impedance monitoring. Following a carbonation challenge, impedance measurements demonstrate persistently elevated values consistent with esophageal air retention [7,8].

Notably, a 2021 study reported a median 24-hour esophageal air presence of 10.5%, which decreased to 0.7% after therapy. Episodes of gastroesophageal gas reflux and esophageal air entrapment were infrequent in the supine position [7].

5.3 Fluoroscopy

Fluoroscopy has been investigated as a potential diagnostic tool for R-CPD. Nevertheless, while barium contrast studies can reliably detect A-CPD, they are not thought to be capable of establishing a definitive diagnosis of R-CPD [1,3]. In a 2021 report, Karagama noted that barium swallow examinations demonstrated distention of both the esophagus and stomach due to trapped gas [4].

5.4 Endoscopy

Upper endoscopy can be valuable in the diagnostic process for excluding underlying structural abnormalities. Available studies have not demonstrated significant structural or functional findings in patients with R-CPD, indicating limited usefulness of these procedures for diagnosis [4,8,21].

5.5 Burp Score

A multidisciplinary team of three otolaryngologists and one gastroenterologist developed the Burp Score, the first clinical tool designed to document the presence, severity, and frequency of R-CPD symptoms. Based on ten symptom domains, the score ranges from 0 to 150. Its responsiveness was demonstrated by significant score reductions 3–6 months after botulinum toxin injection, particularly for gurgling noises, inability to belch, chest pain, excessive flatulence, and hiccups. Baseline scores were not predictive of treatment response. The Burp Score may be a useful tool for both diagnosis and assessment of treatment outcomes, but further data are needed to confirm its reliability and clinical utility [2].

6. Differential diagnosis

Differential diagnosis is infrequently addressed in the literature, likely due to the highly characteristic constellation of symptoms associated with R-CPD and the fact that the condition remains relatively underrecognized. Nevertheless, it is important to consider conditions for which patients with R-CPD are commonly treated when initially seeking medical care. Gastroesophageal reflux disease is most frequently mentioned, often leading to empiric treatment with proton pump inhibitors or antacids [3,8,13,15]. However, there are indications that R-CPD and GERD may coexist in some patients, with hypotheses suggesting that GERD may develop secondary to R-CPD or, conversely, that R-CPD may arise as a consequence of GERD. [10,11,12]. Irritable bowel syndrome is also commonly suggested. Structural esophageal disorders, such as achalasia or hiatal hernia, may be considered during diagnostic evaluation. Other proposed explanations include aerophagia and psychosomatic disorders [7,15,21].

7. Treatment

7.1 Pharmacological

Numerous studies have noted that patients had previously undergone pharmacological treatment prescribed by physicians. Among the medications most frequently mentioned were proton pump inhibitors and antacids typically prescribed due to a suspected diagnosis of GERD. Additionally, attempts have been reported with other therapeutic agents, including: metoclopromide, nifedipine, propranolol, cimetidine, sucralfate, simethicone, rifampicin, levosulpride, charcoal, neuroleptics and anxiolytics. These pharmacological interventions did not produce significant alleviation of symptoms [1,8,13,15,21].

7.2 Botulinum toxin

Based on the available literature, injection of botulinum toxin into the cricopharyngeus muscle is currently the most commonly employed treatment modality for R-CPD.

The first report addressing this therapeutic approach appeared in 2019, when Bastian and Smithson published a landmark study involving 51 patients. Their findings demonstrated that all treated individuals experienced either complete resolution or marked improvement of symptoms following botulinum toxin injection, with restoration of the ability to belch observed in every case. Long-term outcomes were defined as those evaluated at least six months after treatment. Symptoms recurred in some patients 8-20 weeks after injection, necessitating repeat treatment [3]. It has been observed, and subsequently confirmed in later studies, that the therapeutic effects of botulinum toxin in patients with R-CPD persist beyond the expected duration of its pharmacological action [4]. The effectiveness of this treatment is further supported by manometric findings demonstrating a reduction in basal upper esophageal sphincter pressure and an increase in UES relaxation following botulinum toxin injection. Consequently, esophageal air presence time decreased, accompanied by improvement of esophageal symptoms [7,10].

7.2.1 Dose

Given the variability in symptom recurrence timing, the optimal botulinum toxin dose remains undetermined. It is possible that no universal dose exists and that treatment should be individualized according to factors that have yet to be fully elucidated. The most commonly reported doses range from 25 to 100 units [3,4,5,7,9,10,22]. Some authors advocate initiating treatment with a higher dose, such as 100 units, to achieve immediate and complete symptom resolution and to prolong therapeutic effect, potentially reducing the need for or delaying repeat injections [4,20]. The literature includes a brief mention of botulinum toxin doses of up to 170 units, noted in a study primarily focused on other treatment approaches [16]. There is also a case report describing successful treatment with a very low dose of botulinum toxin (10 units)[21].The meta-analysis indicates a dose-response relationship, with increasing botulinum toxin A doses up to 100 units associated with higher rates of sustained symptom relief, while doses above this threshold confer no additional benefit [23].

7.2.2 Pediatric considerations

Pediatric data on R-CPD have begun to emerge. In reported studies, botulinum toxin doses between 65 and 75 units were used, resulting in symptomatic improvement in all treated children. Owing to the lack of consensus on optimal pediatric dosing and the consistently high treatment response, a cautious strategy starting with lower doses has been suggested. Moreover, younger patients appeared to demonstrate a tendency toward a more pronounced early therapeutic response to botulinum toxin type A, although this observation did not achieve statistical significance [6,8,20].

7.2.3 Side effects

Many patients do not experience adverse effects following this treatment, and when side effects do occur, they are generally mild, self-limited, and typically resolve within a few days without

requiring additional intervention. The literature reports adverse events such as transient dysphagia (especially for solid foods), mild and occasional regurgitation, effortful swallowing, dyspnea on exertion, dyspnea during speech, noisy breathing and dysphonia [4,21,24]. In pediatric populations, one study reported a case of dysphagia requiring steroid treatment, while a separate pediatric study noted that the youngest participant developed symptoms of gastroesophageal reflux [6,8].

7.2.4 Techniques and settings of botulinum toxin injection

R-CPD has been effectively treated using endoscopic esophagoscopy with botulinum toxin injection into the cricopharyngeus muscle under short outpatient general anesthesia. Over time, however, subsequent studies have sought to refine this approach by reducing procedural costs, minimizing patient exposure to general anesthesia, decreasing the risk of adverse effects, and shortening procedure duration. These objectives are particularly relevant given that repeat injections-and in some cases multiple treatment sessions-may be required to maintain symptom control.

In an effort to optimize treatment of R-CPD, several alternatives to operating-room-based esophagoscopic injection under general anesthesia have been developed. Electromyography-guided percutaneous botulinum toxin injection into the cricopharyngeus muscle can be very accurate, achieving symptom relief in all treated patients while allowing the procedure to be performed in an in-office setting. This approach reduces procedural costs, avoids general anesthesia, and provides an option for patients who cannot tolerate anesthesia, with outcomes comparable to those achieved in the operating room [22,23]. Additional refinements, initially developed for the treatment of A-CPD, include the combined use of ultrasound, balloon catheter, and electromyographic guidance to precisely localize the cricopharyngeus muscle, enabling a short procedure duration. The results of this approach appear promising [15,25]. Furthermore, in-office transtracheal injection has been introduced to deliver botulinum toxin along the entire length of the cricopharyngeus muscle while minimizing spread to adjacent laryngeal muscles. Mild, transient dysphagia and intermittent reflux have been reported, but all patients experienced significant improvement [24]. A 2025 case report described a transnasal, in-office botulinum toxin injection. In the reported patient, symptom relief was observed within two days, lasted approximately four months, and was accompanied only by transient dysphagia[26].In the operating-room setting, a recent study has investigated the use of THRIVE (high-flow, humidified nasal oxygenation) as an alternative to traditional intubation during endoscopic cricopharyngeal injections, enhancing visualization and reducing the risk of airway trauma and aspiration[27]. Comparative study suggests that both in-office and operating-room-based injections are effective treatment options for R-CPD, with similar long-term outcomes, allowing the choice of approach to be guided by patient preference and clinical considerations [28]. According to a 2025 meta-analysis, direct endoscopic injections were associated with higher early success rates compared to indirect, EMG-guided approaches, although long-term outcomes were comparable [23].

7.3 Myotomy

Another approach, though scarcely reported in the literature, is cricopharyngeal myotomy. Bastian and Hoesli (2020) described a case in which a patient, experiencing recurrent symptoms after botulinum toxin injection, underwent myotomy with approximately 80% division of the cricopharyngeus muscle using a CO_2 laser. The patient reported significant symptom relief, and at six-month follow-up noted a marked improvement in quality of life. While effective, this technique carries a low but notable risk of complications, including subcutaneous emphysema and, rarely, mediastinitis [17]. Hoesli et al. (2020) mentioned partial cricopharyngeal myotomy, reporting that among three patients, one achieved sustained symptom relief, another experienced initial improvement followed by recurrence, and follow-up information was not available for the third patient [5]. This approach is generally considered a second-line option

for patients who do not achieve durable symptom relief from botulinum toxin injection. Currently, only limited data are available regarding its efficacy.

7.4 BERP

Behavioral Eructation Retraining Protocol (BERP) is an intervention which trains patients to adopt a posture that facilitates belching, including laryngeal lowering, jaw protrusion, head turn and tuck, and torso stabilization. BERP may serve as an effective supplementary strategy for patients who achieve only partial relief from cricopharyngeal botulinum toxin injections, potentially enhancing symptom improvement and limiting the necessity for additional interventions. This approach may serve as a valuable adjunct to standard therapy, as multidisciplinary management is often associated with improved patient outcomes. Further studies are needed to evaluate the efficacy of this strategy [16].

8. Discussion

From the initial description of symptoms in 1987 until 2019, only a limited number of case reports were published. A turning point occurred in 2019 with the landmark study by Bastian and Smithson, which stimulated broader academic interest in this condition. Over the past six years, a growing body of literature has emerged, progressively clarifying the pathophysiology of R-CPD, refining diagnostic and therapeutic approaches, and exploring its impact on patients' quality of life.

The impact on quality of life represents a crucial aspect of the discussion surrounding R-CPD. The condition is primarily associated with persistent, daily pain and discomfort. In addition, abdominal bloating, excessive gas, and characteristic gurgling noises are often perceived as socially embarrassing. Anticipation of symptoms leads many patients to avoid eating outside the home or participating in social situations. Patients frequently report feelings of embarrassment, heightened anxiety, and, in some cases, depressive symptoms related to the condition.The burden of symptoms has, in some reports, been linked to the occurrence of suicidal thoughts. Patients report experiencing significant physical discomfort, which often leads them to avoid foods and activities that exacerbate their symptoms, as well as certain clothing due to bloating [3,4,12,14,29].

Despite the significant increase in awareness and knowledge about R-CPD, the condition remains underdiagnosed and undertreated by specialists. Patients report being misdiagnosed and inadequately treated, as healthcare providers were unfamiliar with the condition and unsure of where to seek appropriate help. In many cases, patients are forced to seek diagnosis and treatment abroad. This is compounded by the fact that many patients resort to self-diagnosis via the internet, a phenomenon highlighted in several studies. In a Reddit-based survey, 128 out of 199 respondents reported never receiving a formal diagnosis. Additionally, patients described in various studies often reported self-diagnosing based on online information, which subsequently led them to consult a specialist in R-CPD. Online communities, such as a Reddit group with 26,000 members, TikTok videos with over 30 million views, and Facebook groups, have become vital sources of support for those affected by this rare disorder. While the internet serves as an invaluable tool for individuals with rare diseases, self-diagnosis can also pose significant risks. It is crucial to raise awareness among healthcare professionals about the existence of this condition [3,7,12,20,29,30].

It is possible that in some individuals symptoms are relatively mild or, having been present since childhood, are perceived as normal. Others may forgo extensive and costly diagnostic workups. Consequently, the true prevalence of R-CPD may be substantially underestimated, and the affected population larger than currently recognized.

Given the current state of knowledge, further research is needed to better understand the pathophysiology of R-CPD, potential associated abnormalities and disorders, as well as possible risk factors, including familial predisposition. At present, no consensus exists

regarding definitive diagnostic criteria for R-CPD. Some authors advocate a therapeutic trial of botulinum toxin injection, considering symptomatic improvement as confirmatory of the diagnosis, whereas others recommend systematically excluding alternative causes before initiating treatment [3,7]. Additionally, more precise studies are required to determine the most effective and safest dosing regimens or treatment protocols, tailored to the injection method. Long-term efficacy of treatment must also be assessed, along with identifying factors that may influence treatment response and the duration of remission following therapy.

9. Conclusions:

Retrograde cricopharyngeal dysfunction (R-CPD) is an underrecognized condition with a characteristic symptom profile that significantly impairs quality of life and mental health. Its pathogenesis remains incompletely understood. High-resolution impedance manometry provides the most reliable diagnostic approach at this moment. Botulinum toxin injection into the cricopharyngeus muscle is currently the most effective treatment, offering rapid and often long-term symptom relief, with in-office or endoscopic approaches demonstrating comparable results. Further research is needed to refine diagnostics, optimize treatment protocols, and clarify long-term outcomes.

10. Disclosure

Author's Contribution:

Conceptualization: AC,KD,MW,KDW,BC,JC,ZC,NT,DP, ML
Methodology: KDW,ZC, ML
Formal analysis:DP,MW, BC,JC,
Investigation: JC,NT,ML,DP
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