

# Recent Concepts on Cyclic Vomiting Syndrome in Children

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Cyclic vomiting syndrome (CVS) is a functional gastrointestinal disorder that can occur in both children and adults. Clinical courses of CVS manifesting recurrent severe vomiting episodes and interval illness may affect the long-term quality of life in children with CVS. Therefore, we should be careful in accessing a patient suggestive of CVS. Accurate diagnosis based on diagnostic criteria for CVS and the exclusion from other organic diseases mimicking clinical manifestations of cyclic vomiting is absolutely required. In patients diagnosed as CVS, optimal therapy should be performed to improve symptoms and to reduce complications in prodromal phase and emetic phase, and long-term prophylactic therapy should be tried to prevent the development of vomiting episodes. The identification of triggering factors which induce vomiting episodes might be helpful in preventing vomiting attacks. Systematic approach should be recommended to improve clinical outcome of CVS.

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## Key Words

Cyclic vomiting syndrome, Diagnosis, Therapy, Child

## Introduction

Cyclic vomiting syndrome (CVS) is a disorder characterized by recurrent episodes of nausea and severe vomiting with symptom-free intervals between the episodes and stereotypic patterns within individuals.<sup>1</sup> CVS is classified as one of the functional gastrointestinal disorders based on the Rome III.<sup>2,3</sup> Thorough investigations to distinguish CVS from various organic disorders manifesting with cyclic vomiting, are required.

In this review article, the diagnostic criteria and clinical features of CVS will be investigated, and also recent concepts on the

diagnosis, treatment, prophylaxis, and clinical outcomes of CVS will be discussed.

## Diagnostic Criteria of Cyclic Vomiting Syndrome

CVS was first described by Gee<sup>4</sup> in the St. Bartholomew's Hospital Reports of 1882. CVS is a functional disorder featured by recurrent discrete episodes of intense nausea and vomiting - median 6 times per hour at peak -, lasting hours to days and interval wellness returning to usual status.<sup>4</sup>

The first diagnostic criteria of CVS were set up at the 1st in-

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**Table 1.** Rome III Criteria for Cyclic Vomiting Syndrome in Children and Adults<sup>2,3,7</sup>

Children	Adults
<p>Must include <i>all</i> of the following:</p> <ol style="list-style-type: none"> <li>Two or more periods of intense nausea and unremitting vomiting or retching lasting hours to days</li> <li>Return to usual state of health lasting weeks to months</li> </ol>	<p>Must include all of the following:</p> <ol style="list-style-type: none"> <li>Stereotypical episodes of vomiting regarding onset (acute) and duration (less than 1 wk)</li> <li>Three or more discrete episodes in the prior year</li> <li>Absence of nausea and vomiting between episodes</li> </ol> <p>Supportive criterion History or family history of migraine headaches. *Criteria fulfilled for the last 3 mo with symptom onset at least 6 mo before diagnosis</p>

ternational symposium on CVS held in 1994.<sup>5</sup> Thereafter, a revised criteria for CVS at the 2nd international scientific symposium held in 1998, the Rome II criteria in 1999, and the Rome III criteria in 2006 were suggested as new clinical criteria for CVS.<sup>2,3,6</sup> The most noticeable point is that previous criteria of CVS were only for children, but a newly developed Rome III criteria for functional gastrointestinal disorders is including the diagnostic criteria of CVS for both children and adults (Table 1).<sup>2,3,7</sup>

In 2008, new diagnostic criteria for CVS in childhood were suggested as a part of the North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition consensus statement on the diagnosis and management of CVS (Table 2).<sup>8</sup>

## Epidemiology of Cyclic Vomiting Syndrome

CVS had been regarded as a rare disease before, but now it

seems to be relatively common in pediatric population with the prevalence between 1.9% and 2.3% according to the data of previous reports.<sup>9,10</sup> The annual incidence of CVS was 3.15 per 100,000 children for 2005 in Ireland.<sup>11</sup>

There are no data on the prevalence of CVS in adults until now, but recently there are several articles reporting CVS cases in adults.<sup>12-14</sup> It is assumed that CVS might be more common even in adults than expected before.<sup>12</sup>

CVS has been reported to be slightly more common in female than in male (55:45 or 60:40) in all age groups.<sup>8,12,15,16</sup>

CVS can develop in any age, but it has been mainly reported in childhood, with mean age between 4.6 years and 6.9 years.<sup>9,16,17</sup> There are some reports on adults with CVS, and in adults, mean age at initial diagnosis was 34.8 years.<sup>17,18</sup> In many patients with CVS, it took several months to years in making a definite diagnosis for CVS.

## Clinical Features of Cyclic Vomiting Syndrome

CVS is clinically characterized by recurrent, stereotypic episodes of intense nausea and vomiting lasting hours to days that are separated by symptom-free intervals lasting weeks to months.<sup>4</sup> 'Stereotypic' episode means that each episode is similar within individuals as to time of onset, intensity, duration, frequency, and associated symptoms and signs. CVS typically has 3 phases: prodromal phase, emetic phase, and well phase between the episodes. Approaching the patient according to each phase is clinically important to diagnose and treat a patient with CVS.

Approximately 40-80% of CVS patients are having their own triggering factors evoking vomiting episodes.<sup>15,16,19</sup> Psychologically excessive stress and emotionally excited state are the most common triggers. Infections (sinusitis, respiratory infection),

**Table 2.** New Diagnostic Criteria for Children With Cyclic Vomiting Syndrome Suggested by the North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition Consensus Statement<sup>8</sup>

All of the criteria must be met to meet this consensus definition of cyclic vomiting syndrome.

- At least 5 attacks in any interval, or a minimum of 3 attacks during a 6 mo period
- Episodic attacks of intense nausea and vomiting lasting 1 hr-10 days and occurring at least 1 wk apart
- Stereotypical pattern and symptoms in the individual patient
- Vomiting during attacks occurs at least 4 times/hr for at least 1 hr
- Return to baseline health between episodes
- Not attributed to another disorder

motion sickness, physical exhaustion, excessive exercise, over-eating, specific foods (chocolate, cheese, etc.), menstruation, hot weather, and asthmatic attacks also can trigger vomiting episode in CVS patients.<sup>16,19</sup>

About one third of CVS patients show prodromal symptoms before vomiting episodes attack. Prodromal symptoms of CVS consist of change in mood, aura common in migraine, abdominal pain, dyspepsia, nausea, easy fatigability, anxiety, headache, dizziness, etc.<sup>9,15,20</sup>

Vomiting episodes of CVS usually begin at the same time of day stereotypically, especially at dawn and in the morning.<sup>9,15,16</sup> Vomiting episodes repeat 4-12 times a year showing similar patterns in each patient.<sup>9,19,21</sup> Episodes usually continue from 2 hours to 10 days, and CVS patients show intensive emesis that develop minimum 4 vomiting per hour during the first hours of each episode.

Every vomiting episode eventually resolves spontaneously even if left untreated. Most patients return to usual health condition as soon as the episode stops. However, more than one third of CVS patients can show vomiting symptoms even during well phase between the vomiting episodes.

Intense vomiting during the episodes is associated with other symptoms in most patients with CVS. Nausea and abdominal pain on periumbilical or epigastric area are the most common associated symptoms. Headache, mild fever, loose stools, excessive drooling, photophobia, intolerance to noise, pallor, tachycardia,

and mild elevation of blood pressure are also common.<sup>16,18,21</sup> Leukocytosis is often observed during vomiting episodes in CVS patients.

Various complications may occur related to vomiting symptoms. Massive prolonged vomiting can cause dehydration and electrolyte imbalance in emetic phase. Gastritis, esophagitis, Mallory-Weiss tear, weight loss, dental caries, and psychiatric problems including social withdrawal and depression, can be complicated secondary to intensive vomiting episodes.<sup>20,22</sup>

Clinical manifestations of CVS in children are somewhat different from those of adult patients (Table 3).<sup>17</sup> Duration of each vomiting episodes are shorter in children than in adults.<sup>12,17</sup> Interepisodic nausea or dyspepsia is rare in children with CVS, but common in adult patients.<sup>17</sup> Some adult patients are initially misdiagnosed as gastroparesis due to clinical similarity. Namin et al.<sup>14</sup> reported that 5% of adult patients suspected to be gastroparesis finally turn out to be CVS. Therefore, the diagnosis for CVS is more frequently delayed in adults than in children.

However, in a study by Prakash et al. in 2001,<sup>13</sup> it was regarded that there were striking similarities in clinical manifestations across age groups. The only difference was the duration of vomiting episodes that lengthened progressively from infancy into adulthood.<sup>13</sup>

### Associated Disorders with Cyclic Vomiting Syndrome

Migraine and motion sickness are commonly associated with vomiting episodes of CVS. According to previous studies, 11-21% of CVS patients accompany migraine headache, and 29-46% accompany motion sickness.<sup>9,20</sup> Migraine and family history of migraine were noted in 39-81% of CVS patients in childhood, and in 24-70% of adult patients.<sup>17</sup>

Even more, both irritable bowel syndrome and family history of irritable bowel syndrome are more common in CVS patients (67% vs. 62%) than in general population (10-20% vs. 14%).<sup>23</sup>

Epilepsy is approximately 10 times more common in CVS patient than in general population.<sup>16,23</sup> However, there was no CVS patient showing epileptic seizure in Korea.<sup>15</sup>

Children with CVS often accompany psychiatric disorders such as anxiety disorders or depression.<sup>24</sup>

Family history of CVS was also common in CVS patients (3%) than in general population (0.4-2.0%).<sup>23</sup>

**Table 3.** Comparison of Clinical Features Between Children and Adults With Cyclic Vomiting Syndrome (Adapted and Modified From Abell et al.<sup>17</sup>)

	Children	Adults
Age at diagnosis	4.6-5.3 yr	34.8 yr
Delay in diagnosis	2.6-3.1 yr	7.9 yr
Duration of episodes	2.0 days	3.8 days
Interepisode intervals	1.0-3.1 mo	3.0 mo
Prodromal symptoms	Common	Common
Symptoms during episode		
Vomiting	Universal	Universal
Abdominal pain	Common	Common
Interepisodic nausea or dyspepsia	Rare	Common
Associated psychiatric manifestations	Common	Common
Migraine headache or family history of migraine headache	Common	Common

## Differential Diagnosis of Cyclic Vomiting Syndrome

Cyclic vomiting occurs not only in CVS patients but also in other organic diseases clinically mimicking CVS. Therefore, the diagnosis of CVS should be done very carefully, ruling out all possible organic causes of cyclic vomiting. Previous study reported that among patients manifested as cyclic vomiting, 5% had gastrointestinal disorders, 7% were due to other organic disorders, and only 88% were compatible with CVS.<sup>25</sup>

Clinically differential diagnosis of CVS includes gastrointestinal disorders such as bowel obstruction, inflammatory disease of gastrointestinal tracts, pancreatic diseases, and hepatobiliary diseases; infectious diseases such as parasite infestation and protozoa infection, otitis media, chronic sinusitis, and hepatitis; neurologic disorders such as migraine, epilepsy, and space occupying CNS lesions; metabolic and endocrine disorders such as diabetes mellitus, Addison disease, pheochromocytoma, aminoaciduria, organic aciduria, fatty acid oxidation disorders, mi-

tochondrial disorders, and urea cycle defects; medications and toxins such as antibiotics, NSAIDs, laxatives, high dose fat soluble vitamins, hormones, etc.; urologic/gynecologic disorders such as pelvi-ureteric junction obstruction and nephrolithiasis; and miscellaneous disorders and psychiatric disorders (Table 4).<sup>26</sup>

## Suggested Hypotheses on the Pathogenesis of Cyclic Vomiting Syndrome

The etiology and pathogenesis of CVS still remain unknown. It is assumed that various factors can affect the development of vomiting episodes in CVS, and severe hypotheses have been suggested as possible etiologies: migraine variant,<sup>27</sup> mitochondrial diseases including mitochondrial fatty acid oxidation disorders,<sup>28,29</sup> gastrointestinal motility disorder,<sup>30</sup> corticotropin-releasing factor in response to stress,<sup>31</sup> disorder of the brain-gut axis,<sup>32</sup> autonomic dysfunction,<sup>33</sup> abdominal epilepsy, ion channel dysfunction, and altered psychodynamics, etc.

Recent concept on CVS is mitochondrial energy depletion due to mitochondrial mutation along with precipitating stress or

**Table 4.** Differential Diagnosis of Cyclic Vomiting in Children and Adolescents (Adapted and Modified From Forbes et al.<sup>26</sup>)

Gastrointestinal disorders
Bowel obstruction (malrotation with volvulus, internal hernia, duplication cyst, and intermittent duodenal intussusception)
Inflammatory diseases (gastritis, duodenitis, peptic ulcer disease, chronic appendicitis, and inflammatory bowel disease)
Pancreatic diseases (pancreatitis and pancreatic pseudocyst)
Hepatobiliary disease (hepatitis)
Infections
Enteric agents ( <i>Giardiasis</i> , <i>Gastrospiroillum</i> , <i>Entamoeba coli</i> , <i>Blastocystis hominis</i> , and pinworms)
Otitis media, chronic sinusitis, and hepatitis
Neurologic disorders
Migraine
Epilepsy
Space occupying central nervous system lesions (hydrocephalus, posterior fossa tumors, subdural hematoma, and subdural effusion)
Familial dysautonomia
Metabolic and endocrine disorders
Diabetes mellitus, Addison disease, and pheochromocytoma
Aminoaciduria, organic aciduria, fatty acid oxidation disorders, mitochondrial disorders, and urea cycle defects
Medications and toxins
Antibiotics, non-steroidal anti-inflammatory drugs, laxatives, high dose fat soluble vitamins, hormones, etc.
Urologic/gynecologic disorders
Pelvi-ureteric junction obstruction
Nephrolithiasis
Miscellaneous disorders
Abdominal migraines
Abdominal epilepsy
Hypothalamic surge
Asthma
Benign paroxysmal positional vertigo

excitement may predispose the onset of vomiting episodes in patients with CVS.<sup>34</sup>

Genetic association including A3243G mitochondrial DNA mutation was also suggested as the possible cause of CVS.<sup>35</sup>

Food allergy was also suggested as a possible pathogenesis of CVS by Lucarelli et al.<sup>36</sup> in 2000. However, there have been no more studies on the relationship between CVS and food allergy; it is yet controversial.

## Diagnostic Evaluation for Children with Cyclic Vomiting

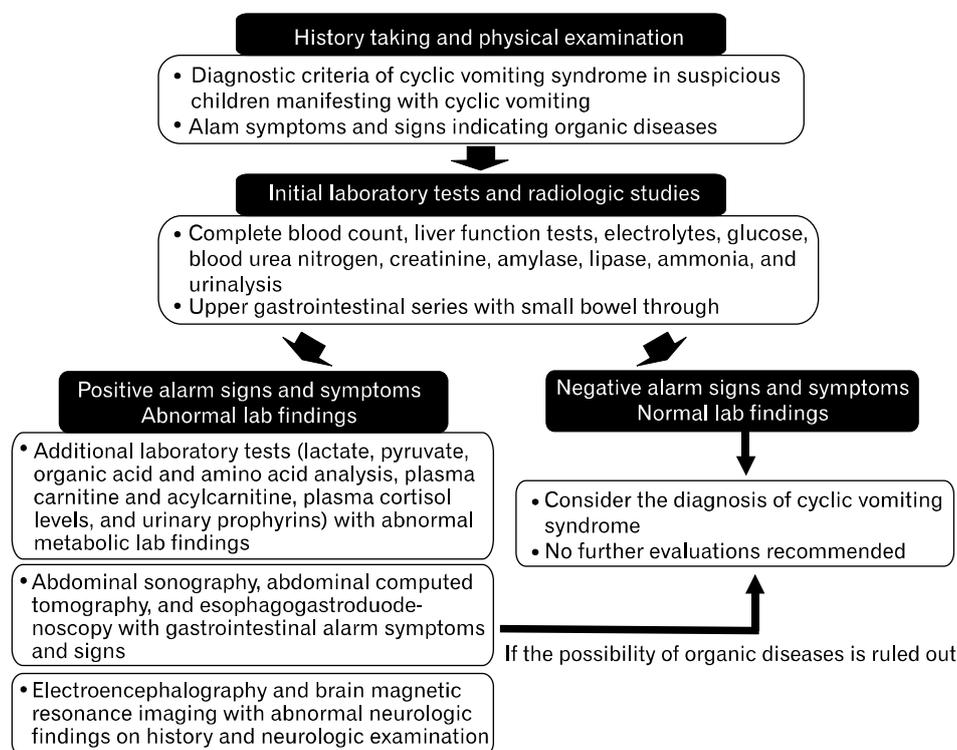
Thorough history taking and physical examination are essential to diagnose the CVS and to rule out organic diseases causing cyclic vomiting. Alarm symptoms and signs are important clues for the differential diagnosis of cyclic vomiting in children. Suspicious alarm symptoms and signs clinically suggestive of organic diseases are bilious vomiting, severe abdominal pain accompanied by abdominal tenderness, hematemesis, attacks precipitated by acute illness and prior fasting or high protein meal, neurologic symptoms and signs (such as irritability, altered mental status, seizure, abnormal eye movements, papilledema, and

motor asymmetry), and progressively worsening vomiting episodes.<sup>8</sup> These symptoms and signs are mainly indicating the possibility of significant gastrointestinal diseases, metabolic disorders, neurologic diseases, or other organic diseases manifesting cyclic vomiting.<sup>8</sup>

Laboratory studies including complete blood count, liver function tests, electrolytes, glucose, blood urea nitrogen, creatinine, amylase, lipase, ammonia, urinalysis, and pregnancy test for adolescents, are basically recommended in all patients.

Laboratory metabolic findings include hypoglycemia, substantial anion gap metabolic acidosis, respiratory alkalosis, or hyperammonemia especially during vomiting episodes.<sup>8</sup> Therefore, if clinically indicated, additional laboratory tests such as lactate, pyruvate, organic acid and amino acid analysis, plasma carnitine and acylcarnitine, plasma cortisol levels, and urinary porphyrins can be performed to exclude the possibility of metabolic and endocrine disorders.<sup>8</sup>

Barium contrast study of upper gastrointestinal tract with small bowel follow through, abdominal sonography, or abdominal computed tomography are useful radiologic methods to find out organic lesions possibly which can cause cyclic vomiting features. Barium studies are usually performed to rule out organ-



**Figure 1.** Recommended diagnostic algorithm of cyclic vomiting syndrome in children.

ic gastrointestinal diseases including chronic intestinal pseudo-obstruction and malrotation.<sup>17</sup> Esophagogastroduodenoscopy is recommended to rule out upper gastrointestinal disorders like peptic ulcer diseases.

If a patient reveals neurologic manifestations, electroencephalography and brain magnetic resonance imaging can be excellent diagnostic tools to detect intracranial abnormalities.<sup>8</sup>

Recommended diagnostic algorithm of the CVS in children is shown in Figure 1.

## Strategies for the Treatment of Cyclic Vomiting Syndrome

### 1. Prophylactic therapy in prodromal phase

When children diagnosed as CVS begin to manifest prodromal symptoms, various therapeutic trials can be applied to prevent the attack of vomiting episode. These kinds of prophylactic therapy in prodromal phase includes the control of stressful life style (lying down in a dark, quiet environment or hot bath), high carbohydrate ingestion, anti-emetic agents (ondansetron and granisetron), anti-anxiety agents (lorazepam), anti-migraine agents (sumatriptan and zolmitriptan),<sup>17</sup> and has been mainly tried in pediatric patients. However, the effectiveness of these therapies was not proved due to the lack of data.

Recommended medications during prodromal phase of CVS are as follows: 5-HT<sub>3</sub> receptor antagonists (ondansetron and granisetron), anti-histamines (diphenhydramine), phenothiazines (promethazine), benzodiazepines (lorazepam), and anti-migraine agent (sumatriptan).<sup>8,17</sup>

Recently, the Pediatric Guidelines Committee of North American Society for Pediatric Gastroenterology, Hepatology and Nutrition commented on the efficacy of anti-migraine 5HT<sub>1B/1D</sub> receptor agonists (sumatriptan) during prodromal phase or early phase of emetic episodes in children with family history of migraine.<sup>8</sup> Actually, this 5HT<sub>1B/1D</sub> receptor agonist was not approved for use in children and adolescents younger than 18 years of age. However, it is recommended to try out this agent as early as possible to terminate an episode in children 12 years and older who have mild episodes less than 1 episode per month.<sup>8,37</sup>

### 2. Medical treatment for cyclic vomiting syndrome in emetic phase

No treatment has been proved to be effective in controlling

emetic phase of CVS until now. The goal of therapy during emetic phase is the termination of vomiting episodes as soon as possible for a patient to return to usual life and the prevention of complications such as dehydration and electrolyte imbalance, caused by intensive vomiting.

In acute phase of emetic episodes, patients should be admitted to the hospital to provide dark, quiet surroundings and to prevent severe dehydration and correct electrolyte imbalance with hydration of intravenous fluids. Gastric acid suppressing agents including proton pump inhibitors (omeprazole) and H<sub>2</sub> receptor antagonists (ranitidine) may be helpful in preventing mucosal damage of the esophagus.

Intravenous anxiolytic agent, lorazepam (0.05 to 0.1 mg/kg/dose every 6 hr) is effective in suppressing vomiting symptoms or sedate patients in acute emetic episodes. Intravenous injection of 5-HT<sub>3</sub> receptor antagonists ondansetron (0.3 to 0.4 mg/kg/dose every 4 to 6 hr, upper limit of 20 mg/dose) and granisetron, or anti-histamine diphenhydramine (1.0 to 1.25 mg/kg/dose every 6 hr) can be tried to reduce vomiting symptoms.<sup>8,17</sup>

**Table 5.** Recommended Prophylactic Drugs for Children With Cyclic Vomiting Syndrome (Adapted and Modified From NASPGHAN consensus<sup>8</sup>)

In children 5 yr or younger	
Antihistamines:	
Cyproheptadine (0.25 to 0.5 mg/kg/day divided bid or tid)	
- first choice	
Alternatives: pizotifen	
β-Blockers:	
Propranolol (0.25 to 1.0 mg/kg/day divided bid or tid) with heart rate monitoring - second choice	
In children older than 5 yr	
Tricyclic antidepressants:	
Amitriptyline (begin at 0.25 to 0.5 mg/kg, increase up to 1.0-1.5 mg/kg) with electrocardiogram monitoring for QTc interval before starting and 10 days after peak dose	
- first choice	
Alternatives: nortriptyline	
β-Blockers:	
Propranolol (0.25 to 1.0 mg/kg/day divided bid or tid) with heart rate monitoring - second choice	
Other agents	
Anticonvulsants: Phenobarbital	
Alternatives: topiramate, valproic acid, gabapentin	
Coenzyme Q10 (10 mg/kg/day divided bid or tid, max 100 mg tid)	
L-carnitine (50 to 100 mg/kg/day divided bid or tid, max 1 g tid)	

NASPGHAN, North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition; QTc, corrected QT.

### 3. Prophylactic therapy during well phase

The goal of long-term prophylactic therapy of CVS is to prevent repetitive vomiting episodes or to decrease the severity of symptoms during episodes, thus, allowing patients to continue normal life.

Prophylaxis of symptomatic vomiting episodes is focused on the identification and avoidance of triggering factors and prophylactic drugs. If precipitants causing vomiting episodes can be identified in each patient, it may be possible to prevent the attacks of episodes by avoiding stressful events, infection, specific foods, sleep deprivation, triggering foods (chocolate and cheese), and motion sickness.<sup>26</sup> Life style modification also include avoidance of energy-depleted states (fasting, acute infection, and acute illness) based on Boles' hypothesis.<sup>35</sup>

Medical prophylaxis in children with CVS is composed of various medicines that are known to be somewhat effective in preventing vomiting episodes: amitriptyline, cyproheptadine, propranolol, etc. (Table 5).<sup>8,17</sup>

Based on the similarity in clinical features between CVS and migraine, anti-migraine agents (cyproheptidine, pizotifen, propranolol, etc.) can be tried especially in patients with migraine headache or family history of migraine.<sup>38</sup> Cyproheptadine, anti-histamine and serotonin receptor antagonist is effective in young children and is the first choice in children 5 years old or less.<sup>8,39</sup> And,  $\beta$ -blocker propranolol is recommended as the second choice prophylactic drug in children with CVS of all ages.<sup>8</sup>

Tricyclic anti-depressive agent, amitriptyline is more effective as prophylactic drugs in children older than 5 years and adults.<sup>39,40</sup>

Although most prophylactic medications are relatively safe even in children, heart rate monitoring and electrocardiogram monitoring are required while administering and dosing up propranolol and amitriptyline because these drugs can cause bradycardia and arrhythmia, respectively, as side effects.<sup>8</sup>

There were several trials on other prophylactic agents. In a study by Vanderhoof et al.,<sup>41</sup> oral erythromycin (20 mg/kg/day) was tried to patients with CVS as a prokinetic agent, which was suggested to be effective in some patients, but the efficacy was not confirmed due to poor quality of the study.

Anti-epileptic drugs were not effective regardless of electroencephalogram finding, however, a few studies are reporting the efficacy of valproic acid<sup>42</sup> and phenobarbital.<sup>43</sup>

Recently, alternative prophylactic medications including coenzyme Q10 and carnitine are suggested to be possibly

effective.<sup>44,45</sup>

It is difficult to predict the response to medication in individuals. Therefore, various factors that can affect the efficacy of therapy, that is, age, co-morbid diseases, drug dosage, and adverse effects of drugs, should be considered before initiating prophylactic medication.<sup>8</sup> When the diagnosis for CVS is confirmed based on the diagnostic criteria and diagnostic testing, individualized therapy can be tried with a first-line drug, starting from low dose and carefully increasing every 1 to 4 weeks up to therapeutic range, for at least 2 cycles of vomiting episodes.<sup>8</sup> If the medication is not effective in preventing the attack of episodes or if there are significant adverse effects, the second-line drug or combination therapy should be considered. However, long-term prophylactic strategies are not confirmed yet.

Further studies are needed in the future on the effective prophylaxis of CVS based on its pathogenesis.

### Long-term Outcome of Cyclic Vomiting Syndrome in Children

It is not easy to predict clinical course and long-term outcome of CVS in children due to lack of data. Many patients eventually recover from CVS, but some patients suffer from migraine headache later. And, vomiting episodes are repeated even in adulthood in more than one third of CVS children.<sup>15,46,47</sup> Therefore, regular follow-up and monitoring of disease courses are required in children with CVS for a long time or maybe lifelong in some patients.

### Conclusion

Because CVS is a relatively common functional gastrointestinal disorder in children, we should be careful in approaching the patients manifesting cyclic vomiting. CVS has its own unique clinical features of recurrent severe vomiting episodes and intervening wellness, which can affect long-term morbidity in patients. Early diagnosis applying the diagnostic criteria for CVS to rule out organic diseases is important in patients. Recommended therapeutic strategies for CVS are targeting the reduction of symptoms and complications in prodromal phase and emetic phase. Long-term prophylaxis is focused on the prevention of vomiting episodes. Individualized systematic approach is recommended in children with CVS for accurate diagnosis and better clinical outcome.

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