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BRIEF COMMUNICATION

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A Case of Frequent Arousal Following Nocturnal Dyspnea Caused by Gastroesophageal Reflux Disease

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Gastroesophageal reflux disease (GERD) is a common disorder that is associated with many esophageal syndromes and complications. Most cases of reflux event occur during the day, but reflux during sleep can cause not only esophageal problems, but also sleep problems, such as arousal and poor sleep quality. We report the case of a 17-year-old man who had been referred to us with frequent arousal following sudden dyspnea. On polysomnography, no respiratory disturbances and periodic limb movements were found during the sleep study, but frequent events of arousal were reported (arousal index: 12.3/h). On a 24-hr esophageal pH monitoring test, his DeMeester score was 176.43 and the total reflux time was 1120.9 min (76.9%), indicating the presence of significant acid reflux. After treatment with a proton-pump inhibitor, the arousals following nocturnal dyspnea and fatigue in the morning disappeared in the patient. GERD should be considered as a cause of spontaneous arousal or awakening not accompanying respiratory disturbances.

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Key Words Gastroesophageal reflux disease, Arousal, Dyspnea, DeMeester.

INTRODUCTION

Gastroesophageal reflux disease (GERD) is a common condition that is characterized by the repeated overflow of stomach contents into the esophagus.[1] In Western countries, the approximate prevalence of GERD ranges from 10% to 20% when defined by at least one heartburn and/or acid regurgitation episode per week.[2-4] In Asia, the prevalence rate is lower than those of Western countries (less than 5%).[5,6]

Individuals with GERD typically suffer from heartburn, acid regurgitation, and sometimes chest pain during day and night.[1,7] GERD is associated with a variety of esophageal complications (e.g., esophagitis, stricture, and Barrett's esophagus) and extra-esophageal syndromes (e.g., reflux cough, reflux laryngitis, asthma, and sleep apnea).[1,7-9]

Gastroesophageal reflux (GER) can occur both during sleep and while awake, but it is much less common during sleep.[10] GER occurring during sleep may induce discomfort and frequent arousal. Therefore it could be an important cause of disrupted sleep. In this study, we present a case of frequent arousal following nocturnal dyspnea caused by GERD.

CASE REPORT

A 17-year-old man was referred to the Korea University Ansan Hospital for sleep evaluation due to frequent sudden awakenings following dyspnea during sleep. Moreover, he complained of chest tightness and heartburn during the nights. He also had fatigue in the morning and re-

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ported snoring. He was diagnosed to have asthma-like symptoms at another hospital, but the symptoms did not improve in spite of the appropriate asthma treatment. He had a history of allergic rhinitis and febrile seizures. The physical examination showed that patient's weight was 78.6 kg and height was 175 cm (body mass index = 25.7 kg/m^2).

On cephalometry, abnormal opacification of paranasal sinuses, bony defect, soft tissue swelling, and pathologic findings were not observed. No abnormality in the chest was found on the chest X-ray. The immune serum test for allergens revealed that specific IgE-D2 mite-farinae was highly elevated (more than 1000 IU/mL). The EKG showed sinus bradycardia with sinus arrhythmia. The blood chemistry and hematology examination did not show any abnormal findings. We performed nocturnal polysomnography (PSG) to investigate whether the nocturnal dyspnea was associated with sleep-disordered breathing (SDB) because GERD and SDB are often comorbid diseases.[11,12] and the patient reported fatigue in the morning, raising a suspicion of SDB. The apnea-hypopnea index was 0.1/h, but the arousal index was 12.3/h (Table 1). The total time with snoring during sleep was 25.8 min (6.3%). Periodic leg movement was not observed throughout the sleep study. Since abnormal events that can result in dyspnea were not found during the PSG, we conducted additional tests, including a 24-hr esophageal pH monitoring for reflux disease, a 48-hr full electroencephalography (EEG) monitoring for seizure, and a methacholine test for asthma. The 24-hr esophageal pH monitoring test showed a DeMeester score of 176.43, and a total reflux time of 1120.9 min (76.9%). Thus, significant acid reflux was present. Results for 48-hr full EEG monitoring and methacholine test were normal and negative, respectively. Taken together, the patient was diagnosed with GERD and we prescribed the proton-pump inhibitor Lanston (15 mg), accordingly.

The patient was followed-up after 16 weeks use of medication. Although we did not perform a follow-up PSG, the patient reported sudden nocturnal awakening due to dyspnea was absent and that his morning fatigue had disappeared.

Table 1. Polysomnographic parameters before treatment

Sleep efficiency, %	89.8
Sleep stage, % of total sleep time	
1	24.5
2	56.9
3	6.7
REM, % of total sleep time	12
AHI, no./h	0
Arousal, no.	43
Arousal index, no./h	12.3
Total time with snoring, min (%)	25.8 (6.3)

AHI: apnea-hypopnea index.

DISCUSSION

Gastroesophageal reflux disease has been linked to pediatric apnea, asthma, and obstructive sleep apnea (OSA). In particular, GERD is very common in OSA, as it is found in 54−76% of the patients.[13,14] Given that patients with OSA syndrome often complain of heartburn, which is a known clinical symptom of GERD patients, we first thought that the cause of the nocturnal dyspnea in our patient could be SDB, such as OSA. However, no abnormal breathing patterns were found throughout the sleep study, except for weak snoring, indicating the dyspnea-related arousals cannot be explained by the SDB.

The arousals induced by GERD can be derived from acute (e.g., reflex) and chronic responses (e.g., airway obstruction by edema). Reflux-related stimulation may induce spontaneous arousals by chemoreflexes to prevent the aspiration of gastric contents into the respiratory system.[15] As a chronic response, an exudative mucosal reaction caused by reflux may induce edema in the respiratory tract, which can partially obstruct the airway.[16]

Sleep may alter gastroesophageal function in a manner that could be of importance in the pathogenesis of GERD.[17,18] The experimental infusion of acid into the esophagus during sleep prolongs esophageal acid clearance (i.e., the ability of the esophagus to neutralize acid) more significantly compared with when it was infused in the waking state.[19,20] Thus, events of GERD are less frequent during sleep, but if they occur, they can produce long periods of acid contact, inducing mucosal inflammation and erosion. Gastric motility and gastric emptying, which have diurnal changes, also can account for GERD. Gastric motility and gastric emptying are slowed during NREM sleep and the evening hours, respectively.[21] The decreased activity of the gastric function can elevate gastric pressure during the night; thereby contributing to a nocturnal reflex.

Medications for acid suppression are likely to be effective in improving sleep measures. Patients who were subjected to acid suppression revealed significantly reduced numbers of nocturnal waking events. They also reported less daytime sleepiness and improved sleep quality after treatment.[22,23]

This study has several limitations. First, since PSG in conjunction with a distal esophageal pH evaluation test was not performed, whether reflux events and dyspnea are causally linked is unknown. Second, we did not quantitatively and objectively examine improvements in the reflux events-related arousal, acid contact time, and sleep quality before and after treatment because the PSG and 24-hr esophageal pH monitoring tests were not performed after treatment. The improvements were only reported from the patient's description.

This study suggests that GERD should be considered as a cause of spontaneous arousal or awakenings unaccompanied by respiratory disturbances. It also demonstrates that treatment with acid suppressors is effective for arousal or awakenings due

to nocturnal dyspnea associated with GERD but not accompanied by SDB.

Conflicts of Interest

The authors have no financial conflicts of interest.

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