UNEXPECTED PRESENTATIONS OF SLEEP APNOEA: USE OF CPAP IN TREATMENT

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Continuous positive airway pressure (CPAP) given through a nasal mask is standard treatment for obstructive sleep apnoea. By acting as a pneumatic splint and maintaining the patency of the upper airways during sleep it prevents occlusion of the airway and obstructive sleep apnoea, reverses associated hypoxia and hypercapnia, and so consolidates sleep. Because nocturnal gas exchange and the quality of sleep are improved the patients feel better, with less daytime sleepiness and fatigue. Nasal CPAP is well tolerated, and compliance is good.

The typical patient who needs CPAP has obstructive sleep apnoea and complains of snoring, restless sleep, headaches in the morning, and excessive daytime sleepiness. Occasionally, however, patients are referred for treatment of complaints apparently unrelated to sleep. They are seen by a doctor with a particular interest in sleep and sleep disorders, and as a result are found to have a sleep related disorder, the resolution of which cures the primary problem.

For example, some patients with impotence have been referred independently of that

symptom for investigation of possible sleep apnoea. In some of those in whom sleep apnoea was confirmed, treatment with CPAP resulted in clear improvement in erectile functioning. Patients referred to obesity clinics who have undergone years of dieting without benefit have been investigated for sleep apnoea and treated with CPAP and have lost a great deal of weight. Treatment with CPAP may act as a catalyst to weight loss, and the sleep apnoea may then improve sufficiently to allow discontinuation of the CPAP.

To illustrate the scope of presentations of sleep apnoea and the success of treatment with nasal CPAP we present a series of case reports.

Confusion

A 61 year old man presented with a 10 year history of stable organic brain syndrome characterised by diffuse cerebral atrophy on computed tomography. The changes were most pronounced in the left frontal lobe and he had mild dysarthria and impaired memory.

He was admitted to the emergency department with a myocardial infarction after which he developed severe congestive heart failure with bilateral pleural effusions. He then developed acute confusion with complete dysarthria, outbursts of emotional distress, and faecal and urinary incontinence. These symptoms persisted for eight months, during which time he was in hospital awaiting transfer to a nursing home. He was in a vegetative state, unable to communicate, and incapable of doing anything for himself. He continued to have congestive heart failure despite aggressive treatment.

While he was in hospital it was noted that he had Cheyne-Stokes respiration when he was asleep, and this was confirmed by an overnight sleep study which showed recurrent central apnoeas with typical crescendo/decrecendo hyperpnoea alternating throughout sleep. These were associated with frequent arousals, severe hypoxia, and a complete absence of slow wave sleep.

A patient being treated with CPAP.

We have previously shown that CPAP can reverse Cheyne-Stokes respiration, so he was given a therapeutic trial of nocturnal CPAP at a pressure of 10 cm H₂O. He tolerated this well, his Cheyne-Stokes respiration was reversed, and a repeat sleep study showed a pronounced reduction in the numbers of both apnoeas and arousals from sleep. The improvement was associated with consolidation of sleep and improved oxygenation. Shortly after starting CPAP he regained control of his bladder and his bowels. Within three weeks his pleural effusions had resolved and his dyspnoea had improved from class 4 to class 2 (New York Heart Association criteria). More importantly his mental function improved considerably; he regained his ability to speak, his emotional outbursts ceased, he became alert and communicative, and he had regained his previous state of health within a month of starting treatment. No changes in his drug treatment had been made during this period.

As a result he was able to return home. He has been followed up for two years, uses CPAP nightly, and has had no exacerbations of congestive failure or deterioration in his mental state.

Discussion

It is clear that Cheyne-Stokes respiration during sleep can give rise to the symptoms of sleep apnoea. In this case Cheyne-Stokes respiration probably played a part in the development of the demented state as well. Both cardiac failure and mental impairment were relieved by the improvement in oxygenation and the consolidation of sleep as a result of CPAP. This suggests that Cheyne-Stokes respiration or sleep apnoea should be considered in the differential diagnosis of acute and chronic confusional states.

"Heart failure"

A 51 year old man presented to the emergency department with acute congestive heart failure. He had been diagnosed as having idiopathic dilated cardiomyopathy and had had recurrent episodes of acute pulmonary oedema for two years. He was given standard medical treatment for the congestive failure, but continued to have mild pulmonary oedema and a resting left ventricular ejection fraction of 14%. He became short of breath after walking 30 m (100 feet) and had paroxysmal nocturnal dyspnoea.

It was noted during the clinical examination that he had Cheyne-Stokes respiration while sitting in bed, and during the apnoeic phase he would lose attention and fall asleep. He would then wake up at the height of hyperpnoea and would continue the conversation where he had stopped from the previous hyperpnoeic cycle. His wife said that he tended to sleep all day long and was never fully alert. She had also noted recurrent apnoeas, particularly when he was sleeping at night.

An overnight sleep study confirmed the presence of Cheyne-Stokes respiration with

- Sleep apnoea should be considered as a precipitating factor or in the differential diagnosis of:
 - Confusional states
 - Heart failure
 - Nocturnal seizures
 - Nocturnal bradycardia
- Cheyne-Stokes respiration during sleep can give rise to the symptoms of sleep apnoea
- CPAP not only reverses obstructive sleep apnoea but can reverse Cheyne-Stokes respiration as well

recurrent hypoxia and disruption of sleep, and he was started on nasal CPAP at night. This resulted in a pronounced reduction of Cheyne-Stokes respiration, much better sleep, and no more waking up with shortness of breath. His daytime sleepiness resolved completely. More importantly his exercise tolerance increased considerably, and he was able to walk several miles without becoming short of breath.

He was sent home taking nasal CPAP at night, and one month later his left ventricular ejection fraction had increased to 17%. A year later his exercise tolerance had continued to improve, he had had no further episodes of congestive cardiac failure, and his left ventricular ejection fraction was 22%. He was last seen after two years, when his medical treatment was unchanged. He had had no further episodes of cardiac failure, and he continued to use CPAP nightly.

Discussion

This case illustrates the importance of Cheyne-Stokes respiration in a patient whose main complaint was congestive cardiac failure. The respiration was associated with pronounced hypoxia and disruption of sleep, and reversal of the breathing disorder by CPAP resulted in consolidation of sleep and resolution of his symptoms of sleepiness and fatigue during the day. More importantly, his exercise tolerance and left ventricular ejection fraction both improved and he was free of heart failure.

CPAP does not merely reverse obstructive sleep apnoea, but can reverse Cheyne-Stokes respiration as well. In doing so CPAP can lead to consolidation of sleep and improvement of cardiac function.

"Seizure"

A 40 year old asthmatic man who was dependent on steroids presented to the emergency department having had a seizure during the night. He was obese, and weighed about 136 kg (300 pounds). A month before admission his asthma had worsened, his main complaints being orthopnoea and nocturnal dyspnoea, and he had increased his dose of steroid. A week before admission he had fallen asleep sitting in a chair while watching television

and his wife noticed that he had become cyanosed and then started twitching his limbs. He was unrousable, and developed tonic-clonic jerks that affected all his limbs before he woke up in a postictal state. On the night of admission he had had a similar episode.

Examination showed considerable obstruction to air flow, and he was treated with intravenous steroids and inhaled bronchodilators. Investigation for a seizure disorder showed no abnormality and he was not given anticonvulsant drugs.

It was discovered that he had a long history of snoring, was often sleepy during the day, and had headaches in the mornings, so he was investigated for sleep apnoea. The sleep study confirmed a mild degree of obstructive sleep apnoea that was confined almost entirely to rapid eye movement (REM) sleep and was associated with severe hypoxia and mild hypercapnia. Towards the end of the night, during non-REM sleep, the electroencephalogram registered several episodes of 3 cycle/second spike and wave seizure activity with no associated apnoeas.

His asthma was brought under control and he was started on nasal CPAP at night. His morning and daytime sleepiness resolved rapidly and he had no further seizures. A repeat sleep study showed that nasal CPAP had abolished his sleep apnoea and his oxygenation had improved. The seizure-like activity seen on the electroencephalogram was still present, but less frequent and prolonged than previously. He was seen after 14 months, when he was still using CPAP nightly, had had no further symptoms of sleep apnoea or seizures, and his asthma was under control.

Discussion

This case illustrates that there may be an association between nocturnal seizures and sleep apnoea but that it is not clear cut. The suggestion is that the combination of nocturnal hypoxaemia and disruption of sleep may have reduced the seizure threshold, and that seizures became apparent during the exacerbations of asthma and sleep apnoea. Proof of this is lacking, but the fact that he had no further seizures that we know of after reversal of the sleep apnoea is strong

circumstantial evidence. It is also noteworthy that an electroencephalogram taken during the day showed no evidence of seizure activity, though the one taken at night did. This suggests that patients with nocturnal seizures should have routine sleep electroencephalograms, and that sleep apnoea should be considered as a precipitating factor.

Pacemaker inserted—would CPAP have sufficed?

A 49 year old man was referred for investigation of possible sleep apnoea. In his letter the referring doctor wrote "Interestingly, five years ago he had a pacemaker placed for nocturnal bradyarrhythmias." The patient remembered being told that his heart had stopped beating for nine seconds during the night. In retrospect it is possible that he had had the typical bradycardia/tachycardia of sleep apnoea, but the clinical notes were not available.

At the time that he was referred he had many clinical features of sleep apnoea. The sleep study showed nine apnoeic events/hour of sleep, each one lasting from 16-160 seconds during REM sleep and 10-80 seconds during non-REM sleep. Oxygen saturation ranged from 78-97%, and 86-96%, during REM and non-REM sleep, respectively. The electrocardiogram showed intervals of paced rhythms lasting 10-15 seconds which corresponded with apnoeic events.

Treatment with CPAP shortened and reduced the number of apnoeic events, improved his oxygen saturation, and reduced the number of paced rhythms during the night.

Discussion

Cyclical bradycardia during sleep is a typical feature of sleep apnoea, and treatment of the apnoea would probably have obviated the need for a pacemaker.

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The ABC of Sleep Disorders has been edited by Professor Shapiro.

SUGGESTIONS TO AUTHORS

The poet James Beattie advises in 1776 on the writing of book reviews

In giving an account of new books, I would aim rather to inform the public, than give vent to my own admiration or dislike; and be brief and modest in panegyric, and in censure very sparing and very merciful, except where the work animadverted upon appeared to have been written with a bad intention. To publish a dull book is a misfortune rather than a fault. . . . Reviewers are apt to begin their account of a book with some commonplace observation of their own. This, I think should be avoided, except where it is necessary to prepare the reader for understanding what is to follow. . . . A review ought to

consist of three parts and no more—an account of the author's plan; a specimen of his manner; and a brief character of his work.

Forbes M. Beattie and his friends. Altrincham: Martin Stafford, 1990:128. (First published 1904.)

"This will never do!"

Opening words of Francis Jeffrey's 30 page attack on Wordsworth's *Excursion* in the *Edinburgh Review*, November 1814, which did not follow Beattie's suggestions.