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SHORT COMMUNICATION

Routine polysomnography in an epilepsy monitoring unit

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Summary Up to 13% of patients with epilepsy have moderate or severe sleep-disordered breathing, in particular obstructive sleep apnea (OSA), a disorder associated with reduced quality of life, worsened seizure control, and increased cardiovascular morbidity and mortality. Combining video-EEG monitoring with polysomnography (VPSG) provides the opportunity to diagnose clinically significant OSA as well as relate the occurrence of seizures and the epilepsy diagnosis to the presence and severity of sleep-disordered breathing. We have established routine VPSG in our inpatient video-EEG monitoring unit and present our findings in 87 patients. Clinically significant sleep-disordered breathing was diagnosed in 19 of 87 (22%) patients. Patients with psychogenic non-epileptic seizures (PNES) had poorer sleep quality compared to patients with epilepsy and those with neither diagnosis, whereas the prevalence of clinically significant sleep-disordered breathing in patients with PNES (29%) did not differ significantly compared to patients with epilepsy (21%) and those with neither diagnosis (22%). The differences in sleep quality are not explained by differences in body mass index (BMI) or anti-epileptic drug (AED) effects.

Introduction

Studies of nocturnal disorders using a combination of video-EEG and polysomnography (VPSG) have been performed for over twenty years (Aldrich and Jahnke, 1991). VPSG is often used to characterize undiagnosed paroxysmal motor dis-

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orders of sleep (Derry et al., 2006). However, it is not routinely used by epilepsy monitoring units to diagnose sleep-disordered breathing.

Up to 13% of patients with epilepsy also have moderate or severe sleep-disordered breathing, in particular obstructive sleep apnea (OSA) (Malow et al., 2000; Manni et al., 2003). This is roughly double the prevalence of 3—7% found in the general population (Punjabi, 2008) and it has been postulated that these findings might be partly explained by variables associated with the epilepsy diagnosis, such as increased body mass index (BMI) and anti-epileptic drug (AED) effects (Manni and Terzaghi, 2010). Patients with epilepsy are more frequently overweight compared to the general population (Malow et al., 2000), and increased BMI is a risk factor for OSA (Park et al., 2011). AEDs may induce or worsen OSA by reducing respiratory centre reactivity and/or airway tone (Manni and Terzaghi, 2010), and certain AEDs such as sodium valproate might induce or worsen OSA by a combination of both increased BMI and respiratory effects. It is important to diagnose clinically significant OSA in patients with epilepsy, as treatment with continuous positive airway pressure (CPAP) improves sleep quality and seizure control (Vendrame et al., 2011). Despite this, clinicians rarely consider the potential impact of sleep-disordered breathing in patients with epilepsy (Manni and Terzaghi, 2010).

Patients with psychogenic non-epileptic seizures (PNES) are commonly admitted to epilepsy monitoring units and may represent up to 25% of admitted patients (Bazil et al., 2003). It has been shown that body mass index may be higher in patients with PNES compared to patients with epilepsy (Marquez et al., 2004). It therefore follows that sleep-disordered breathing may be more common in patients with PNES compared to the general population, but to our knowledge this has not been studied.

The epilepsy monitoring unit at The Royal Melbourne Hospital has established routine polysomnography in all video-EEG monitored patients, and we report our findings in 87 patients. Our primary aim was to assess the feasibility and practicality of performing routine polysomnography in an epilepsy monitoring unit. Our secondary aims were to assess sleep-disordered breathing prevalence in patients with PNES, and to compare the effects of BMI and AED use on sleep-disordered breathing prevalence in patients with epilepsy and patients with PNES.

Methods

Video-EEG monitoring

The epilepsy monitoring unit at The Royal Melbourne Hospital contains four monitored inpatient beds. Scalp electrodes are placed according to the 10—20 International System and video-EEG is recorded using Compumedics Profusion™ 4 software (Melbourne, Australia) from Monday morning until Friday morning. At the end of the week, each case is discussed at a multidisciplinary case conference attended by epileptologists, neuroradiologists, neuropsychiatrists, and neurosurgeons, and a consensus is reached regarding the seizure diagnosis as well as recommendations for subsequent investigation and management.

Sleep analysis

Each patient's perception of his or her sleep quality is measured on the first day of admission using a validated questionnaire, the Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989). A PSQI score greater than 5 indicates poor sleep quality.

Polysomnography is performed on the last evening of admission and sleep parameters (chin EMG, electrooculogram, nasal airflow, thoracic and abdominal effort, arterial oxygen saturations, and body position) are recorded using Compumedics Profusion™ 4 Software (Melbourne, Australia) according to current polysomnography practice parameters (Kushida et al., 2005). A qualified sleep scientist stages and scores each sleep study, and a sleep physician reviews each study with regards to the presence and severity of clinically significant sleep-disordered breathing. The sleep scientist and the sleep physician are both blinded to the epilepsy diagnosis. We defined clinically significant sleep-disordered breathing as an apnea-hypopnea index (AHI) of 15 per hour or greater (AHI, a measure of sleep apnea severity, is calculated by dividing the number of hypopneas and apneas by the total sleep time; an AHI of 15 per hour or greater indicates sleep apnea of at least moderate severity).

Results

Patient clinical characteristics are shown in Table 1. The mean PSQI score for the whole patient population was 8.3; patients with PNES had a significantly higher mean PSQI score (11) compared to patients with epilepsy (7.8) or neither diagnosis (7.1) (unpaired t-test, $P < 0.05$). The mean BMI for the whole patient population was 27.6; although the mean BMI was higher in patients with PNES (30.5), the difference was not significant compared to patients with epilepsy (27.2) and neither diagnosis (26.8) (unpaired t-test, $P = 0.11$ and 0.08, respectively).

Polysomnography results are shown in Table 2. Clinically significant sleep disordered breathing for the whole population was diagnosed in 19 of 87 (22%) patients. Of these 19 patients, 15 (79%) were diagnosed with OSA, 1 (5%) was diagnosed with CSA, and 3 (16%) were diagnosed with mixed sleep apnea. Clinically significant sleep-disordered breathing was diagnosed in 5 of 17 (29%) patients with PNES compared to 9 of 43 (21%) patients with epilepsy and 5 of 23 (22%) patients with neither diagnosis; although sleep-disordered breathing prevalence was higher in patients with PNES, the difference was not significant compared to patients with epilepsy and patients with neither diagnosis (Pearson's chi-square test, $P = 0.54$ and 0.56, respectively).

Data on AED use are shown in Table 3. Patients with PNES were significantly more likely to be taking no AEDs on admission compared to patients with epilepsy (Pearson's chi-square test, $P < 0.05$). Patients with epilepsy were significantly more likely to be taking either two or three concurrent AEDs on admission compared to patients with PNES (Pearson's chi-square test, $P < 0.05$). The most common AEDs used in the whole patient population were levetiracetam (23 patients), sodium valproate (20 patients), carbamazepine (18 patients), a regular benzodiazepine (14 patients), and lamotrigine (12 patients); on admission, all five of these