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SCIENTIFIC INVESTIGATIONS

Outcome of Patients With Sleep Complaints and Normal Polysomnograms

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Study Objective: To determine the outcome in patients with sleep complaints and normal polysomnograms (PSG).

Background: PSG is used in the evaluation of persons with sleep complaints. There is a small amount of literature available on patients with sleep complaints and normal PSGs.

Methods: PSGs interpreted as normal at the sleep laboratory at Wake Forest University Baptist Medical Center over a 3-year period were considered for inclusion. All PSG requests were screened for appropriateness. Follow-up data were obtained by structured telephone interview (within a period of 5 months of PSG) and chart review. This interview requested: (1) main sleep complaint, (2) diagnosis given by the ordering physician, (3) treatment for the sleep complaint, (4) further studies, and (5) overall satisfaction.

Results: Forty-six patients were identified with a normal PSG, and 27 (58%) were successfully contacted for the telephone interview. Of these 27 patients, 8 were men and 19 were women. Fifty-two percent of patients were not given a diagnosis by the referring physician after their normal PSG to explain their sleep symptoms. Eight patients (29%) were offered treatment for their sleep complaints despite their normal PSGs. Twenty patients (74%) reported no change in their sleep quality since the PSG. Most patients (66%) did not find the PSG helpful.

Conclusions: The majority of patients with sleep complaints and normal PSG were not given a clear diagnosis by the referring physician, and sleep complaints persist after a normal PSG. Further evaluation by a sleep specialist may be appropriate.

Keywords: Polysomnogram, sleep disorders, diagnosis

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It has been estimated that the prevalence of obstructive sleep apnea in the United States is 7 to 18 million.[1] An increasing recognition of other sleep disorders has probably led to a significant increase in the number of polysomnographic studies (PSGs).[2] According to 1 large survey, 5% to 10% of patients referred for evaluation of insomnia or excessive daytime sleepiness had no significant PSG abnormalities, but there is little follow-up information in the literature on patients with sleep-related symptoms and normal PSGs. The purpose of this paper is to present demographic and follow-up data on patients with sleep complaints who meet strict criteria for a normal PSG.

METHODS

All PSGs interpreted as normal at our institution over 3 years were considered for inclusion. The sleep laboratory at Wake Forest University Baptist Medical Center is an accredited sleep center, and all PSG requests are prescreened for the presence of a sleep complaint. All patients then have telephone follow-up to determine if the referring physician took action based on the results of the PSG. Sleep-lab referrals are accepted from a variety of physicians, including primary care physicians, neurologists, and otolaryngologists. All referring physicians are asked if they would prefer a sleep-clinic evaluation first, rather than progressing to a PSG. The referring physician's preference for proceeding directly to PSG is honored after the sleep-lab physician reviews the patient's clinic records provided by the outside referring physician.

PSGs were classified as normal if they met strict age-related criteria considered in the following variables: stage (< 5% of sleep time), 2 (45%-55%), slow-wave sleep (13%-23%) and REM sleep (20%-25%); sleep efficiency (> 85%); respiratory disturbance index (< 5); and periodic limb movement arousal index (< 5). These criteria are based on 2 standard deviations above and below the mean of previously published PSG data obtained from a large sample of normal healthy adults during the first night of study.[3] Only patients with sleep-related complaints were included. Exclusion criteria included age less than 20 years, history of uvulopalatopharyngoplasty, and abnormalities on multiple sleep latency testing, or undergoing nocturnal penile tumescence study. Because of the relatively strict criteria, only 46 patients (2%) of 800 studies were included.

The diagnosis pretest and posttest was recorded, and a questionnaire was undertaken in each patient to outline whether his or her perceived sleep disturbance had improved since the PSG, his or her degree of sleepiness, and his or her overall satisfaction with the care he or she received. Data were obtained by structured telephone interview (within a period of 5 months of PSG)

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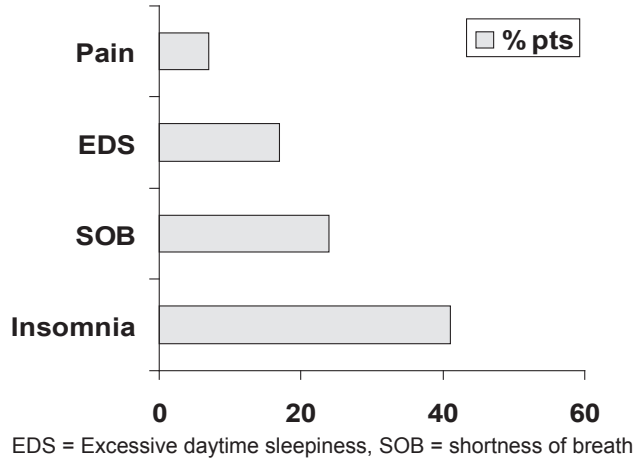


Figure 1—Chief Complaints in Normal PSG's

and chart review. The interview requested information regarding the following: (1) main sleep complaint, (2) diagnosis given by the ordering physician, (3) treatment for the sleep complaint, (4) further studies, and (5) overall satisfaction. In order to assess the patient's daytime sleepiness, the Epworth Sleepiness Scale (ESS) was administered.

RESULTS

Forty-six patients were identified with a normal PSG, and 27 (58%) were successfully contacted for the telephone interview. Of these 27 patients, 8 were men and 19 were women. The age range was 21 to 67 years (average 40.3 years). Previous diagnoses in these patients included 10 patients (37%) with depression, 5 (19%) with fibromyalgia, 7 (26%) with hypertension, and 5 (19%) with stroke.

The most common chief compliant of the patients leading to the PSG was insomnia (41%), followed by nocturnal shortness of breath (24%), and excessive daytime sleepiness (17%). The other primary complaints included pain (7%), and stress, restless legs, and acid reflux (1 patient each) (Figure 1).

The specialty disciplines of the physicians for these patients included 68% patients referred by primary care and internal medicine, 12% referred by pulmonologists, 12% referred by otolaryngologists, and 8% referred by board-certified sleep specialists. Fifty-two percent of patients were not given a specific sleep diagnosis by the referring physician after their normal PSG to explain their sleep symptoms. Diagnoses in the other 48% included "normal," "no reason you can't sleep," fibromyalgia, insomnia due to pain or bipolar disorder, possible multiple sclerosis, "more than average sleep requirements," sleep apnea, stress, deviated septum, and restless legs. According to the sleep diary completed the morning after PSG, 3 of 27 patients (11%) underestimated their total sleep time by greater than 20%, and 2 of these 3 patients had a history of depression. No patient underwent additional studies to evaluate a sleep disorder.

Eight patients (30%) were offered treatment for their sleep complaints despite their normal PSGs. One patient underwent surgery for obstructive sleep apnea. Two patients were diagnosed with deviated septum and offered surgery. The remaining 5 patients (19%) were offered medications. The categories of medications included selective serotonin reuptake inhibitors, benzodiazepines, and other anxiolytics.

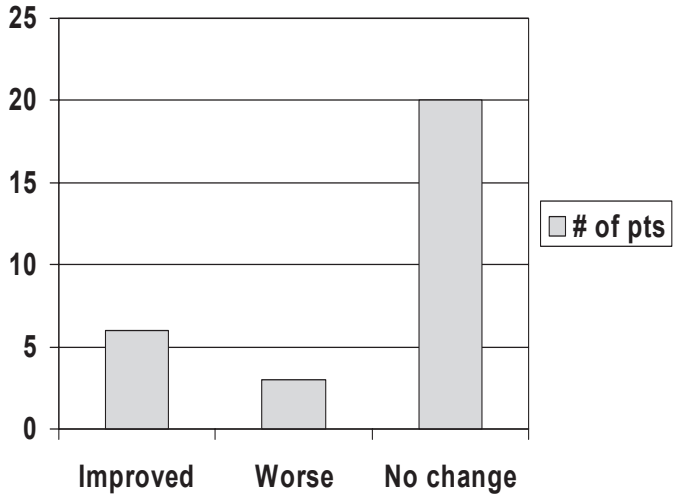


Figure 2—Change in sleep quality since PSG.

Twenty patients (74%) reported no change in their sleep quality since the PSG (Figure 2). Six patients (22%) reported better sleep, and 3 (11%) reported worsening sleep symptoms since the PSG. The patient who underwent surgery for obstructive sleep apnea reported improvement in his or her sleep symptoms. None of the patients who took medication improved. In those 6 patients whose primary complaint was excessive daytime somnolence, the average ESS score was 11.8 (range 2 to 21) on follow-up questioning. Patients rated the PSG as follows: very helpful in 2 patients (5%), helpful in 8 patients (31%), not very helpful in 8 patients (31%), and no help in 9 patients (33%) (Figure 3). Of those who believed the PSG was very helpful or helpful, most patients stated the reason was that serious disease was ruled out. Twenty-four of the 29 patients contacted (88%) were satisfied with the overall care they received for their sleep problems, while 5 patients (19%) were not satisfied.

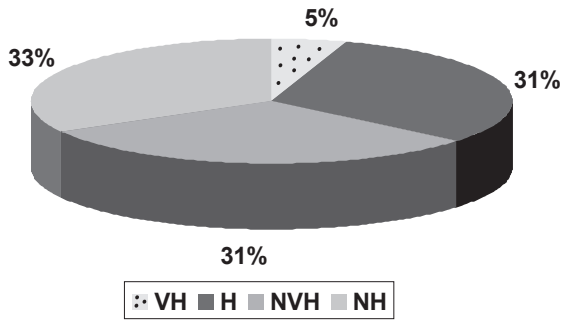
DISCUSSION

The percentage of patients with excessive daytime sleepiness in our review (17%) was lower than would be expected in a tertiary-care population referred for PSG. This is probably due to our selection of patients with a normal PSG for follow-up. None of the patients underwent further evaluation after a normal PSG, and the majority were not subsequently given a definite diagnosis. Only 8 patients (30%) were offered treatment. Not surprisingly, most of the patients (74%) reported no change or poorer sleep quality after the PSG. Thus, our patients' sleep complaints did not improve over time without treatment.

Although his or her PSG was normal, 1 patient reported better sleep after surgery for obstructive sleep apnea. Those patients started on medication after their normal PSG reported no improvement in their sleep symptoms. The lack of treatment or ineffective treatment for these patients can likely be explained by the lack of a diagnosis after PSG.

Not unexpectedly, most patients (67%) did not find the PSG helpful. Those who reported benefit from the PSG felt reassured that the study had ruled out serious disease. Although most of the patients had no change in sleep quality and did not find the PSG helpful, 88% were satisfied with the overall care that they received for their sleep-related problems.

Psychiatric disorders and other types of sleep disorders (includ-



VH=very helpful, H=helpful, NVH=not very helpful, NH=no help

Figure 3—Patients Rating of PSG.

ing sleep-state misperception and psychophysiologic insomnia) have previously been associated with sleep disorders in which the PSG is normal.[4] In this sample, more than half had been diagnosed with fibromyalgia or depression. A "first-night" effect occurs in normal subjects undergoing PSG, manifested by insomnia due to unfamiliar surroundings.[5] A reverse first-night effect may occur in patients with insomnia, as the patients are dissociated from their environment and poor sleep habits in the sleep laboratory.[6]

The female-to-male ratio was 2 to 1 in this study, whereas the female-to-male ratio at our sleep laboratory for all studies over the same time period was 1 to 2. The reason for the higher proportion of women who have sleep complaints but a normal PSG in our study is not clear. Possible contributing factors include a lower incidence of obstructive sleep apnea,[7] and higher incidence of mood disorders and fibromyalgia in women[8,9] and insomnia. Also, genetic factors have been shown to be involved in the etiology of fibromyalgia, pain sensitivity, and mood disorders.[10] These complaints may cluster in certain patients.

Although our strict criteria for defining a normal sleep study significantly reduced the number of patients in our review, our study suggests that the majority of patients with sleep complaints but normal PSG are not given a clear diagnosis by the referring physician. Furthermore, sleep complaints persist after a normal PSG. There are potentially millions of patients with undiagnosed and untreated sleep apnea in the United States alone, 7 and many sleep centers still have long waiting lists. For these reasons, direct referral to a sleep lab for diagnosis of some common sleep problems such as sleep apnea, without simultaneous referral to a sleep clinic, may be appropriate in instances of high pretest probability of finding a sleep disorder. Indeed, the American Academy of Sleep Medicine Standards of Accreditation for Sleep Centers allows for sleep-lab testing to proceed without sleep-clinic referral as long as outside medical records are reviewed before accepting the patient for testing. The need for expeditious access to sleep-lab testing must always be balanced by providing sufficient thoroughness of evaluation, creating an uneasy tension between speed of access and accuracy of diagnosis and adequate follow-up. In accordance with American Academy of Sleep Medicine policy, our sleep-center practice is to provide systematic follow-up on all of our sleep-lab patients.

This study demonstrates some of the pitfalls that can occur when PSG testing is performed without sleep clinic specialty care and highlights the need for close surveillance for all patients after testing. Since only a minority of these patients were referred by a sleep specialist, these findings would seem to support this idea and may also help better determine whether American Academy of Sleep Medicine indications for polysomnography are present in these patients. A prospective study with a larger number of patients is necessary to further characterize this population.

REFERENCES

1. Sher AE. An overview of sleep disordered breathing for the otolaryngologist. Ear Nose Throat J 1999;78:694-708.
2. Tarasiuk A, Reuveni H. Obstructive sleep apnea syndrome: the diagnostic strategy dilemma Isr Med Assoc J 2004;6:686-90.
3. Coleman RM, Roffwarg HP, Kennedy SJ, et al. Sleep-wake disorders based on polysomnographic diagnosis. JAMA 1982;247:997-1003.
4. Mendelson WB. Long-term follow-up of chronic insomnia. Sleep 1995;18:698-701.
5. Roehrs T, Vogel G, Sterling W, Roth T. Dose effects of temazepam in transient insomnia. Arzneimittelforschung 1990;40:859-62.
6. Riedel BW, Winfield CF, Lichstein KL. First night effect and reverse first night effect in older adults with primary insomnia: Does anxiety play a role? Sleep Med 2001;2:125-33.
7. Young T, Palta M, Dempsey J, Skatrud J, Weber S, Badr S. The occurrence of sleep-disordered breathing among middle-aged adults. N Engl J Med 1993;328:1230-5.
8. Blazer DG II. Mood disorders: epidemiology. In: Sadock BJ, Sadock VA, eds. Kaplan & Sadock's Comprehensive Textbook of Psychiatry, Seventh ed. Philadelphia: Lippincott, Williams and Wilkins; 2000: pp 1298-1308.
9. Wolfe F, Ross K, Anderson J, Russell IJ, Hebert L. The prevalence and characteristics of fibromyalgia in the general population. Arthritis Rheum 1995;38:19-28.
10. Arnold LM, Hudson JI, Hess EV, et al. Family study of fibromyalgia. Arthritis Rheum 2004;50:944-52.