



Sleep and Irritable Bowel Syndrome

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Sleep complaints are quite common in patients with irritable bowel syndrome, as well as other gastrointestinal disorders including gastroesophageal reflux disease.¹⁻³ Estimates of the incidence of sleep complaints in IBS patients range from approximately 30–70%.^{1,2} Lethargy and daytime fatigue, which are common side effects of sleep disturbances, seem to also be common complaints in IBS patients. In fact, there have been several studies which have attempted to relate gastrointestinal symptoms in IBS patients to sleep disturbances and vice versa. These studies have shown some relationship between these two symptoms, but the data are not particularly compelling.^{4,5}

Certainly, abdominal pain, and pain from any source, can cause difficulty sleeping as well as arousals from sleep and consequent *sleep fragmentation* [interruptions of the sleep pattern, either to a lighter stage or to wakefulness, that reduce the total amount of time spent in the deeper levels of sleep]. It is safe to say that the average clinician does not necessarily inquire regarding sleep complaints in patients with functional bowel disorders, and frequently patients trivialize these complaints and do not mention them to their treating physician. Both circumstances are regrettable, and a further examination of the relationship between sleep disorders and functional bowel disorders should be helpful to both parties.

Sleep Cycles

We pass through 2 different sleep states in organized cycles throughout the night. In a healthy adult, the first cycle is always initiated by going from wakefulness to non-REM sleep – which includes 4 progressively deeper stages – and then into a REM (rapid eye movement) sleep state. The pattern of REM sleep following the non-REM sleep state completes a sleep cycle. The two sleep states continue to alternate in 90-minute cycles throughout the night. A full night of normal human sleep will usually consist of 4–6 non-REM/REM sleep cycles.

Sleep physiology

Sleep is a compelling biological phenomenon, which is associated with remarkable behavioral and physiological changes. It is a reversible state of behavioral unresponsiveness associated with a welcome sense of revitalization and alertness. Our understanding of the physiological underpinnings of this revitalization is evolving, but remains poorly understood. Sleep complaints are commonly associated with diminished quality of life, coexisting anxiety and depression, gradually diminished performance, and often underlying physiologic sleep abnormalities. Physiologically, sleep is accompanied by unique alterations in the regulation of life-sustaining functions such as respiration and thermal regulation. It has been well documented that during the rapid eye movement (REM) phase of sleep,

normal mechanisms of respiratory and temperature control are suspended.⁶ Thus, REM sleep could be considered an interval of considerable physiologic risk, especially in individuals with compromised respiratory functioning. REM sleep occupies about 25% of normal sleep, and occurs with increasing duration in 90-minute intervals throughout a normal night of sleep.⁷ Thus, almost paradoxically, these intervals of risk are woven into the fabric of normal sleep, which would seem to belie the familiar pleasures of a good night's sleep.

Sleep and gastrointestinal function

Sleep related changes in gastrointestinal functioning have been somewhat less obvious and less dramatic. Also the invasive nature of gastrointestinal monitoring and the relative lack of availability of sleep laboratories have both conspired to retard the development of knowledge with regard to sleep related changes in the way the intestines work (intestinal physiology). Thus, the understanding of the relationship between sleep physiology, alterations in sleep functioning, and sleep complaints in patients with irritable bowel syndrome must include studies that examine the basic physiology of sleep in this patient population. We have conducted numerous studies in our sleep laboratory, which have examined the sleep physiology, autonomic physiology, as well as subjective sleep complaints in a large group of patients with IBS. Our initial interest was to determine whether or not there were objective physiologic abnormalities and/or differences in autonomic functioning during sleep in patients with IBS.⁸ Our initial study examined differences in physiologic functioning during sleep in patients with IBS. This was done via a particular technique for analyzing beat-to-beat heart rate variability to assess how the nervous system regulates this function. Of particular interest is the fact that, in this study, we documented that IBS patients had a notable difference in how cardiac function was regulated during sleep. This was not evident in the waking state, and we have felt that this apparently unique alteration noted only during sleep may be a biological marker of patients with IBS. These results beg the question as to whether the actual *sleep architecture* [i.e., the pattern of sleep stages] is different in patients with IBS.

Sleep and IBS

These results prompted a series of follow-up studies, which have been published in collaboration with several of my graduate students, Sigrid Elsenbruch, Michael Harnish, and Jennifer Thompson. These studies have provided unique data regarding the physiologic function of IBS patients during sleep, and how this may relate to subjective sleep complaints noted in this patient population. All of these studies have involved the administration of several questionnaires, which address sleep

disturbances, and quality of life alterations due to sleep disturbances, as well as full sleep laboratory evaluations to objectively determine sleep patterns. Our initial study revealed that patients diagnosed with IBS did not exhibit any differences in objective sleep measures such as total time, sleep onset time, the amounts of each sleep stage, or arousal responses in sleep fragmentation, compared to a group of age and sex matched normal volunteers.⁹ However, subjective sleep disturbances as noted by several questionnaires were quite significantly elevated in the IBS group. Thus, we concluded that the IBS patients resembled many patients complaining of clinical insomnia in that the sleep complaints appeared to be primarily related to a sleep state "misperception." That is, the sleep physiology was quite normal, but the patients continued to perceive and complain of a variety of subjective sleep abnormalities.

In attempting to further delineate this discrepancy, we were stimulated by the publication by Fass and colleagues, who reported that sleep complaints were more severe in patients who had dyspeptic symptoms in conjunction with their IBS complaints (i.e. altered bowel habit and abdominal pain).³ Thus, in a subsequent study we stratified IBS patients into two groups, those with bowel symptoms only, and those with both lower bowel symptoms and upper dyspeptic symptoms. These were compared to a group of 23 normal volunteers.¹⁰ In this study we documented subjective sleep quality, insomnia symptoms, alertness, anxiety, stress, and daytime and nighttime GI symptoms over a period of four days. The IBS patients clearly reported significantly more dissatisfaction with their sleep quality, as well as increased daytime fatigue and non-restful sleep. Of particular interest, however, is the fact that these complaints were significantly greater in those IBS patients who also had dyspeptic symptoms. Nocturnal GI symptoms were also particularly elevated in those patients who had dyspeptic symptoms. Once again, the sleep physiologic evaluation did not reveal any differences between the patient groups and the normal volunteers. Significant correlations, however, were found between psychological distress and subjective sleep complaints in the patient group. These results provided substantial validation of the Fass data, and stimulated further investigation into how the psychological symptoms, which are commonly noted in IBS patients, may contribute to the subjective sleep complaints, and possibly the abnormal physiology during sleep noted in the above studies.

Psychological factors

Our previous research, thus, led us to pose the question as to whether depression and/or anxiety may be the most important underlying factor in producing the sleep and physiologic abnormalities in patients with IBS. We therefore undertook a subsequent study, which identified and stratified patients with IBS into those with significant depression (as determined by a subjective depression rating scale), and those with IBS without significant depressive symptomatology. The results of this study proved to be quite enlightening. The patients with IBS plus significant depressive symptoms were noted to have a significant increase in subjective sleep complaints, although the IBS patients without depressive symptoms also had elevated subjective sleep complaints (preliminary data presented at DDW 2003, Orlando, Florida). The sleep pattern was also notably abnormal in that the IBS patients with depressive symptoms had a significantly higher rate of arousals from sleep. This is the first time that any sleep abnormality has been documented in patients with IBS, and it clearly appears to be related to the existing coexisting depression.

Summary

The results of these studies suggest that IBS patients do have distinct physiologic abnormalities, which are unmasked during sleep, and sleep complaints appear to be specifically related to sleep disturbances associated with a high level of depressive symptomatology. The high incidence of sleep complaints is very likely accounted for by the high incidence of psychological abnormalities such as depression and anxiety in this patient population. These two psychological factors have been known for some time to contribute significantly to sleep complaints, and individuals with a clinical diagnosis of depression have been shown to have very specific sleep abnormalities.¹¹ It therefore behooves the clinical gastroenterologist to be aware of, and take special note of the presence of these psychological symptoms and treat them appropriately. Almost certainly, this will result in marked improvement in sleep complaints, and the overall quality of life in patients with IBS.

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