Sleep Disorders in Fibromyalgia Syndrome

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Abstract

Chronic pain in patients affected by fibromyalgia is nowadays considered as a result of dysregulated mechanisms in the central nervous system. As fibromyalgia patients often report sleep disturbances, some researches have investigated potential central neural dysfunctions which link chronic pain and alterations responsible for sleep disorders. Polysomnography in fibromyalgia patients reveals increased EEG alpha activity during non REM sleep, increased number of arousal and a more frequent occurrence of cyclic alternating pattern.

Mechanisms potentially linking chronic widespread pain to sleep alterations and mood disorders have not been proved. The relationship between polysomnographic findings and clinical symptoms in patients with fibromyalgia supports the hypothesis of a conceptual common mechanism called central sensation.

The first step in the therapeutic approach is sleep assessment, including sleep history, identification of factors interfering with sleep hygiene and the diagnosis of any underlying disorder that may affect sleep.

Food and Drug Administration has approved drugs for fibromyalgia that can improve sleep quality, but not specific for treatment of fibromyalgia associated sleep disorders.

Both pharmacological and non pharmacological treatments should be used cautiously in fibromyalgia patients, considering underlying disorders and their potential interactions. However they could be an effective treatment both for fibromyalgia related pain and coexisting sleep alteration.

Keywords: Fibromyalgia; Sleep disorders; Chronic pain

Introduction

Fibromyalgia (FM) is a chronic pain disorder of unknown etiology characterized by diffuse musculoskeletal pain and increased tenderness at palpation.

More progress in understanding FM and its related syndromes was made when investigators turned their attention to the role played by the nervous system [1,2].

A large percentage of FM patients report sleep disturbance, including difficulties in falling or staying asleep, early morning awakenings and non-restorative sleep [3-5].

Sleep is a regular circadian phase of reduced activity and responsiveness, with characteristic physiologic changes, especially in the brain [6]. The cyclicity of sleep is linked to other biologic circadian rhythms, such as hormone secretion (e.g., growth hormone, prolactin, and melatonin), body temperature and blood pressure [7].

Research about sleep disorders in patients with chronic pain, particularly in FM patients, overlaps the concept of non restorative sleep. The restorative theory considers brain activity during sleep essential to restore body and mind [8,9]. As non restorative sleep is common in patients with organic sleep disorders, it has been considered a symptom of insomnia. Many studies have investigated the symptoms of insomnia associated with chronic pain syndromes, particularly FM and chronic pain fatigue syndrome, but there are few studies about non restorative sleep: a greater knowledge of non restorative sleep and its mechanisms could provide important insights into the causes of FM and related condition.

Poor sleep quality or quantity increases the risk of medical and psychiatric diseases [10,11].

The current method of assessing physiological sleep parameters is based on polysomnography (PSG), which records muscle tone through an electromyography (EMG), eye movements through electrooculography, and brain activity by means of electroencephalography (EEG). The two main stages of sleep are rapid eye movement (REM) sleep, which is believed to be important for processing and memory consolidation of cognitive stimuli encountered while awake [12], and non-REM sleep, which the American Academy of Sleep Medicine classification currently divides into three stages (N1, N2 and N3), although previously there were four stages [13]. Stage W (wheelfulness), during which the predominant EEG findings are alpha waves with a frequency of 6-12 Hz; stage N1 (light sleep, normally <5% of total sleep time), during which the main EEG findings are theta waves with a frequency of 4-7 Hz (this stage of true sleep is characterised by slow and regular eye movements); stage N2 (intermediate sleep, 40–50% of total sleep time), deeper sleep characterised by EEG findings of sleep spindles and K complex, with no slow and regular eye movements; and stage N3 (deep or slow wave sleep, 20% of total sleep time), characterised by EEG findings of slow delta waves with a frequency of 0.5–2 Hz.

During the first half of sleep, individual's cycle between REM and all stages of non REM sleep; during the second half, the cycling is between stage N2 and REM sleep. Each cycle normally lasts 1–2 hours whereas stage N1 typically lasts <30 minutes.

Aetiology

There are many prospective clinical studies demonstrating a

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Numerous studies identified alpha activity in non-REM stages in adults and children with FM, as well as in individuals with chronic fatigue syndrome [30-33]. It was also hypothesised that EEG alpha activity could be a sleep maintaining or a sleep disrupting factor depending on which part of the brain it comes from Pivik et al. [34]. Several polysomnographic studies of FM patients found disordered sleep architecture with the delayed onset of EEG sleep [32,35], poorer sleep efficiency [17,24] and reduced SWS and REM sleep [24,32,35,36].

The presence of wave alpha intrusion in non-REM sleep is not always found in FM patients. It is common in several health problems in which unrefreshing sleep is presumably related to this anomaly and it doesn't seem to be specific for FM syndrome [4]. The EEG alpha disorders indicate a vigilant state during non-REM sleep leading to daytime symptoms [31] but Chervin et al. [37] in a small-scale study on the presence of EEG alpha during SWS did not mention the anomaly.

Some studies showed a reduction in stage N2 sleep spindles and in stage N2 sleep periods [38,39]. Another study found a high frequency of cyclic alternating pattern (CAP) [40], which is a periodic EEG sleep phenomenon that provides physiological measure of sleep stability. The CAP phase A1 pattern is an index of sleep stability, whereas CAP phase A2 and A3 are markers of progressive sleep instability or poor sleep quality. Increases in these last two patterns were found in FM patients with poor sleep quality associated with disease severity [40].

Abnormalities of circadian rhythm and biochemical alteration

Disturbances of body circadian rhythm can contribute to poor sleep, fatigue and exacerbations of other symptoms of FM [41]. In humans circadian rhythmicity is originated by hypothalamus and FM patients have a disturbed hypothalamic-cortical adrenal axis [42,43]. Many studies show that FM patients have decreased levels of growth hormone (GH) [44,45] and its metabolites, particularly during the night [46].

Moutz et al. [47] used neuro-imaging of FM patients to examine regional cerebral blood flow (rCBF) to specific brain structures and showed that rCBF to the thalamus and caudate nucleus was decreased in FM patients. Moreover, the loss GH secretion during slow wave sleep may be linked to lesions in dorsal medial nucleus of the thalamus [48] suggesting that rCBF may be involved in the GH secretion abnormalities observed in FM patients.

Frequent alpha wave intrusion during delta wave sleep has been associated with the reduced production of GH and insulin-like growth factor 1 (IGF1) [49,50]. Moreover GH and IGF1 are involved in the repair of muscle micro traumas. Sleep disturbances may affect physiological healing mechanisms after muscle-tissue damage. This may alter the transmission of sensory stimuli from damaged muscle tissue to nervous system and enhance the perception of muscle pain [51]. About 90% of FM patients had inadequate GH response to exercise [45] and one-third significantly low circulating IGF-I levels [51].

GH replacement therapy significantly improved symptoms and reduced the number of tender points in FM patients [52]. Elevated cerebral spinal fluid levels of substance P were also found in patients with FM [53]. Substance P, a neuropeptide, is widely distributed throughout the nervous system and may contribute to arousal [54]. Experimental studies showed that substance P influences nociception and sleep via a neurokinin pathway [55].

These findings seem to support the hypothesis that a decrease in substance P levels may reduce the arousing effects of substance P on the
suggested an underlying primary sleep abnormality. FM patients [71], but PSG should be used if a detailed sleep history and related examination suggest an underlying primary sleep abnormality.

References


532-543.


