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Headache and sleep: clinical and therapeutical aspects

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Abstract Sleep disorders and headache are frequently comorbid. Anatomical, biochemical and physiologic common features and pathways could explain the bidirectional influence between sleep disorders and headache. One of the troubles often encountered in the evaluation of the comorbidity between sleep and headache disorders is that patients referring to tertiary headache centres are mainly concerned about their pain and generally do not tend to spontaneously report their possible sleep problems. But when they are specifically asked, very interesting data do emerge. The comorbidity headache-insomnia offers clinicians the opportunity to choose drugs able to control both disorders, avoiding

molecules which could make insomnia worse while improving headache. A polysomnographic recording should be performed when a sleep apnoea headache is suspected and if diagnosis is confirmed, headache therapy should consist of the therapy of sleep apnoea itself. Morning headache in patients with periodic limb movements disorder during sleep is not responsive to standard headache therapy but needs to be treated with specific dopamine agonists which improve headache while relieving nocturnal movements.

Key words Sleep • Headache • Insomnia • Sleep apnoea headache • Hypnic headache • Therapy

The association between headache and sleep disorders has been observed for more than a century though the nature of this relationship is still to be completely understood. Several attempts were made to classify the possible types of comorbidity between these conditions as summarised in Tables 1–3, but a general agreement on this topic has not been reached until now [1–3]. One of the troubles often encountered in the evaluation of comorbidity between sleep and headache disorders is that patients referring to tertiary headache centres are mainly concerned about their pain and generally do not tend to spontaneously report their possible sleep problems. But when

they are specifically asked, very interesting data do emerge. In a sample of 464 adult headache outpatients, the insomnia prevalence reached the value of 56.03%, without difference according to gender (58.80% in females, 48.80% in males, Chi Square test: n.s.) [4]. This percentage of insomnia is surely higher than 19.00% corresponding to the value found in the general population [5]. As shown in Fig. 1, insomnia was more prevalent in the group of patients whose attacks fulfilled the diagnostic criteria for both migraine and tension-type headache. In most cases (75.01%) insomnia was *long term*, lasting more than three weeks [6]. *Short term insomnia*, having a duration of

Table 1 Relationship between sleep and headache according to Sahota and Dexter [1]**Sleep-related headaches (during or after sleep)**

Sleep-phase-related headaches

III, IV, rapid eye movement: migraine

Rapid eye movement: cluster headache, chronic paroxysmal

Hemicrania

Length of sleep and headaches

Excessive deep sleep

Lack of sleep

Sleep disruption

Sleep relieves headaches

Migraine and other types of headaches

Sleep disorders and headaches

Sleep apnoea and headaches

Somnambulism and headaches

Other parasomnias and headaches

Effect of headaches on sleep

Minimal to major sleep disruption

Dreams and headaches

Table 2 Relationship between sleep and headache according to Paiva [2]

Headache is a symptom of a primary sleep disturbance

Sleep disturbance is a symptom of a primary headache disorder

Sleep disturbance and headache are symptoms of an unrelated medical disorder

Sleep disturbance and headache are both manifestations of a similar underlying pathogenesis

Table 3 Relationship between sleep and headache according to Dodick [3]**1. Headache is the result of disrupted nocturnal sleep or the underlying process that disrupts sleep**

a. Obstructive sleep apnoea (OSA) or nocturnal hypoxia or hypercapnia

b. Restless legs syndrome or periodic limb movements of sleep (PLMS)

c. Psychophysiologic insomnia

d. Chronic pain syndrome or fibromyalgia

e. Depression or anxiety

2. Headache is the “cause” of a disturbance of nocturnal sleep

a. Chronic tension-type headache (more than 15 headache days per month for more than 6 months)

b. Chronic migraine with or without analgesic abuse or depression or anxiety

3. Headache and sleep are intrinsically related by anatomy and physiology

a. Migraine

b. Cluster headache

c. Chronic paroxysmal hemicrania

d. Hypnic headache

1–3 weeks [6], was found in 2.30% of headache sufferers and transient insomnia, lasting less than a week, was recorded in the remaining 22.69% [4, 6]. Insomnia symptoms were: prolonged sleep latency (21.15%), more than two nocturnal awakenings (35.00%) and early morning awakening (4.23%) [4]. Most of the patients showed a

mixed pattern, with the association of two or all of the three symptoms of insomnia (39.62%) [4].

In the case of comorbidity between insomnia and headache, therapy should be focused on both disorders by favouring those drugs able to control them and avoiding molecules which could make insomnia worse while

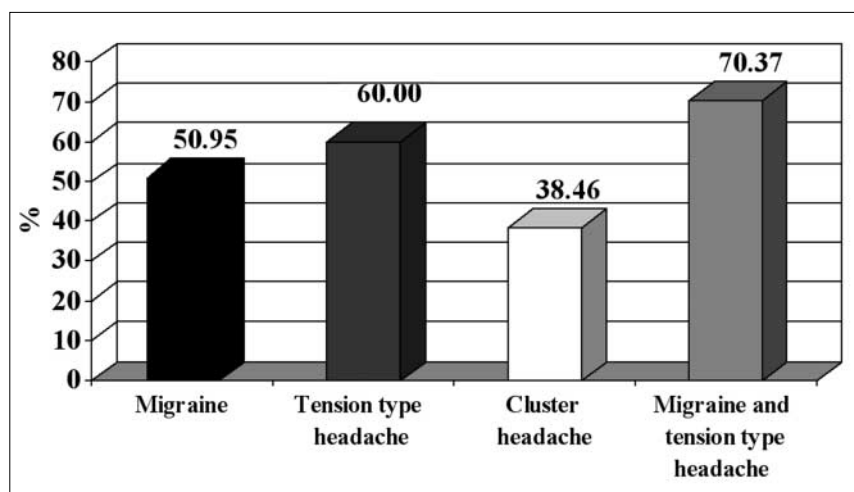


Fig. 1 Insomnia prevalence in a sample of 464 adult primary headache patients. Patients were subdivided into groups according to their specific headache diagnosis

improving headache. An example is given by beta blockers which are considered as first line drugs for the therapy of migraine. Their effects on sleep are represented by an increase of nocturnal awakenings, a decrease of REM sleep, nightmares and insomnia [7]. Flunarizine, on the contrary, can more often cause an increase of total sleep time and a shortening of sleep latency. So flunarizine is effective in headache patients with insomnia except for cases of comorbidity with depression because the latter could be worsened by this molecule. As insomnia might often precede or be associated to anxiety and/or mood disorders, sleep questionnaires and semistructured psychiatric interviews or specific psychodiagnostic tools are very useful to completely evaluate headache patients and to choose the correct therapy.

The administration of a sleep disorder questionnaire showed that snoring is the most frequent sleep disorder reported by headache sufferers immediately after insomnia (40.9%) [8]. Snoring is not to be underrated as it can precede or mask a sleep apnoea syndrome (SAS). SAS is an intrinsic dyssomnia characterised by recurrent episodes of apnoea-hypopnoea occurring during sleep and provoking both arousals and oxygen desaturation. More than 5 episodes for the night are needed (Respiratory Disturbance Index >5) for a diagnosis of sleep apnoea documented by polysomnography [6]. Guilleminault et al. first

described a bilateral, morning headache in 36% of sleep apnoea patients (18 of 50 cases) [9]. This kind of headache was enclosed within the International Headache Disorders Classification in the chapter of "Headache attributed to disorder of homeostasis" and Table 4 shows its diagnostic criteria [10]. No agreement was achieved about the pathogenesis of headache in patients affected by SAS as some authors maintain a major role of hypoxia-hypercapnia, while some others attribute more importance to sleep fragmentation. In a group of SAS patients Goder et al. showed that the occurrence of morning headache was associated with a decrease in total sleep time, sleep efficiency and amount of rapid eye movement sleep with an increase in the wake-time during the preceding night's polysomnographic recording [11]. In the same patients the occurrence of morning headache was not associated with changes in mean oxygen saturation or apnoea/hypopnoea indices when nights with and without following headache were compared [11]. Prudenzano et al. [12] did not find any difference when comparing sleep apnoea patients with and without sleep apnoea headache as for Body Mass Index, RDI, Apnoea-Hypopnoea Index and Sleep Fragmentation Index.

The not yet solved question of sleep apnoea pathogenesis is supported by a comment included in the IHS: "...it is unclear whether the mechanism of 10.13 Sleep apnoea

Table 4 Sleep apnoea headache: diagnostic criteria according to ICHD-2 [10]

- A. Recurrent headache with at least one of the following characteristics and fulfilling criteria C and D:
 1. Occurs on 15 days per month
 2. Bilateral, pressing quality and not accompanied by nausea, photophobia or phonophobia
 3. Each headache resolves within 30 minutes
- B. Sleep apnoea (respiratory disturbance index >5) demonstrated by polysomnography
- C. Headache is present upon awakening
- D. Headache ceases within 72 hours and does not recur, after effective treatment of sleep apnoea

Table 5 Hypnic headache: diagnostic criteria according to ICHD-2 [10]

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- A. Dull headache fulfilling criteria B–D
 - B. Develops only during sleep and awakens patients
 - C. At least two of the following characteristics:
 1. Occurs >15 times per month
 2. Lasts \geq 15 minutes
 3. First occurs after age of 50 years
 - D. No autonomic symptoms and no more than one of nausea, photophobia or phonophobia
 - E. Not attributed to another disorder
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headache is related to hypoxia, hypercapnia or disturbance in sleep” [10].

When a patient reports a morning headache and a SAS is suspected, clinical data are not sufficient for diagnosis. A polysomnographic recording should be performed and if the diagnosis is confirmed, headache therapy should coincide with the therapy of sleep apnoea.

In 1984 Kudrow et al. [13] studied a sample of five chronic and five episodic cluster patients by means of nocturnal polysomnography and found that all the episodic patients and one of the chronic patients had sleep apnoea (60%). The treatment with nasal continuous positive airway pressure (CPAP) was associated with substantial reductions in the frequency and severity of cluster headaches [14].

Morning headache is often a symptom of periodic limb movements in sleep (PLMS), a disorder affecting about 5% of the general population and 19.20% of primary headache sufferers [8, 15]. The pathogenetic mechanism probably underlying this kind of headache is sleep fragmentation with consequent bad sleep quality and insomnia. Sleep deprivation is in fact a well known cause of morning headache in individuals not affected by primary headache [1, 16]. Patients with morning headache secondary to PLMS must be treated electively with dopamine agonists.

Juvenile headache sufferers are not free from the association with sleep disorders. A shorter total sleep time, a longer sleep latency, a scarcely restorative sleep and daily somnolence were described by Bruni et al. [17]. Moreover, migraineurs showed a higher prevalence of sleeptalking, bruxism, nightmares and sleep terror than controls.

Insomnia was found in 23.29% of 219 primary headache sufferers under the age of 18 whereas its frequency in control subjects is about 13.90% [17, 18]. Among both adults, and juvenile primary headache sufferers, a higher percentage of insomnia was found in the group

affected by migraine and tension-type headache than in those with a single headache diagnosis [18]. Headache frequency was higher in the insomniac headache patients than in the non-insomniac ones. The early treatment of headache and possible associated sleep disorders prevents the progression of disease towards chronic forms and further comorbidities. Elderly people are the most common target of a singular and rare type of primary headache named hypnic headache. Table 5 lists the diagnostic criteria of hypnic headache, first described by Raskin et al. [19], which peculiarly awakens the patient from sleep every night and therefore was called the “alarm clock headache”. This headache disorder usually responds well to treatment with lithium carbonate [19]. Its exclusive occurrence during sleep suggests an intimate association with the physiology of sleep in elderly people. One might suppose that degenerative processes leading to loss of neuronal cells in central nervous system and particularly in hypothalamus in which the biological clock is located could alter the circadian rhythms and favour the occurrence of hypnic headache in biologically predisposed individuals [3].

In conclusion, a detailed check of sleep patterns by means of specific questions is always necessary for a correct evaluation of headache patients, the detection of possible comorbid sleep disorders and the choice of an adequate therapy. Historical and clinical data are moreover of fundamental importance to diagnose certain peculiar forms of headache such as hypnic headache which require specific therapies. In some cases a polysomnography might be useful to exclude the possibility of a treatable sleep disturbance such as sleep apnoea and PLMS. If one considers the high frequency of comorbidity between sleep disorders and headache, to neglect sleep evaluation and to treat headache alone will offer a good chance of failing in the management of headache.

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