



## REVIEW ARTICLE

# Non-breathing-related sleep disorders following stroke<sup>☆</sup>

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### KEYWORDS

Cerebrovascular disease;  
Stroke;  
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Sleep disorders;  
Parasomnias;  
Insomnia

### Abstract

**Introduction:** It has been shown that sleep-related breathing disorders, especially sleep apnoea, are very common in patients who have had a stroke, and that they also reduce the potential for neurological recovery. Nevertheless, other sleep disorders caused by stroke (excessive daytime sleepiness, insomnia, sleep-related movement disorders) can also cause or increase stroke-related disability, and this fact is less commonly known.

**Development:** Studies with polysomnography have shown many abnormalities in sleep architecture during the acute phase of stroke; these abnormalities have a negative impact on the patient's quality of life although they tend to improve with time. This also happens with other sleep disorders occurring as the result of a stroke (insomnia, narcolepsy, restless legs syndrome, periodic limb movement disorder and REM sleep behaviour disorder), which are nevertheless potentially treatable. In this article, we briefly review the physiopathology and epidemiology of the disorders listed above in order to raise awareness about the importance of these disorders and the effects they elicit in stroke patients.

**Conclusions:** Sleep disorders that are not breathing-related have scarcely been studied in stroke patients despite the fact that almost all such disorders may present as a result of a cerebrovascular event.

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### PALABRAS CLAVE

Enfermedad cerebrovascular;  
Ictus;  
Sueño;

### Trastornos del sueño no respiratorios en relación con ictus

#### Resumen

**Introducción:** Actualmente se reconoce que los trastornos respiratorios, en especial la apnea del sueño, son frecuentes en pacientes con accidente vascular cerebral y que su presencia reduce el potencial de recuperación neurológica de estos pacientes.

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Trastornos del Sueño;  
Parasomnias;  
Insomnio

Sin embargo, es poco conocido el hecho de que otros trastornos del sueño que también se producen a consecuencia de un ictus como la somnolencia diurna, el insomnio y los trastornos del movimiento también son capaces de producir o incrementar la discapacidad asociada al ictus.

*Desarrollo:* Estudios polisomnográficos han evidenciado múltiples alteraciones en la arquitectura del sueño de los pacientes en la fase aguda del ictus, las cuales tienden a mejorar con el transcurso del tiempo pero manteniendo un efecto deletéreo sobre la calidad de vida. Lo mismo ocurre con trastornos del sueño que se producen como consecuencia de un ictus (el insomnio, la narcolepsia, el síndrome de piernas inquietas, los movimientos periódicos de las piernas y el trastorno de conducta del sueño MOR) todos los cuales son potencialmente tratables. Con el objetivo de incrementar la conciencia acerca de estas condiciones y sus efectos sobre los pacientes con ictus, se revisa brevemente la epidemiología y fisiopatología en la subpoblación de pacientes neurológicos con ictus.

*Conclusiones:* A diferencia de los trastornos respiratorios, otros trastornos del sueño han sido escasamente estudiados en pacientes con ictus, a pesar de que prácticamente todos los trastornos del sueño pueden presentarse a consecuencia de esta enfermedad.

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## Introduction

Sleep disorders (SD) are present in all age groups and significantly affect patients' quality of life. The second edition of the International Classification of Sleep Disorders (ICSD-2) subdivides these disorders into eight major categories: (1) insomnias; (2) sleep-related breathing disorders (SRBD); (3) hypersomnias; (4) circadian rhythm sleep disorders; (5) parasomnias; (6) sleep-related movement disorders; (7) isolated symptoms, apparently normal variants and unresolved issues; and (8) other sleep disorders.<sup>1</sup>

Excellent scientific evidence gathered in the past few years points to an association between SD and cerebrovascular risk/stroke. Therefore, the study of the complex interactions between these two conditions has become an important topic in vascular neurology.<sup>2</sup>

We currently know that SRBDs, particularly sleep apnoea, are more frequent during the acute phase of a cerebrovascular accident (CVA) and that they reduce the patient's capacity for neurological recovery.<sup>3</sup> Additionally, patients with obstructive sleep apnoea experience greater numbers of vascular episodes than healthy subjects do.<sup>4</sup>

However, other SDs may also appear as direct or indirect consequences of stroke.<sup>5</sup> Aside from SRBDs, insomnia and hypersomnias (excessive daytime sleepiness with fatigue and increased need of sleep) are the most frequent SD subtypes in stroke patients, especially in cases of hemispheric, thalamic, or brainstem infarction.<sup>6</sup> As with SRBDs, these subtypes can elicit or exacerbate stroke-related disability. Furthermore, although SDs can be identified easily, their presence is usually underestimated and unjustifiably ignored in patients with cerebrovascular disease. These entities are linked to neuropsychiatric disorders and a less favourable functional outcome.<sup>7</sup>

This review aims to summarise international literature addressing the association between stroke characteristics (topography, severity, and outcome) and presence of SDs other than SRBD.

## Procedure

### Sleep architecture during acute stroke

Normal sleep architecture is severely altered during the acute phase of stroke<sup>8</sup>; multiple factors contribute to this alteration. Firstly, there are factors inherent to the loss of neural tissue (direct lesion to structures linked to the generation or maintenance of the sleep-wake cycle) and subsequent oedema; secondly, we find the consequences of neurological deficit (limited mobility, pain, etc.). The last category describes environmental factors associated with hospitalisation (bed confinement, continuous lighting, noise, etc.).<sup>6</sup>

Sleep quantity is preserved in 52% of the patients during the acute phase of stroke, although total sleep time varies considerably. The number of arousals and hours of daytime sleep increase significantly, and these trends are correlated with poor sleep quality and diminished quality of life.<sup>9</sup>

Polysomnography studies have revealed several alterations in the sleep architecture of patients with acute stroke, such as reductions in total sleep duration and sleep efficiency, increases in sleep latency, and a tendency towards decreased slow wave sleep and rapid eye movement (REM) sleep.<sup>10,11</sup>

Researchers have also documented a correlation between encephalographic changes and stroke severity as measured by the Scandinavian Stroke Scale (SSS).<sup>12</sup> Another polysomnography study performed by Terzoudi et al.<sup>13</sup> showed a positive correlation between REM sleep latency and 3-month functional outcome measured by Barthel index. According to their findings, patients with the worst outcomes experienced a marked decrease in REM sleep latency compared with patients with better outcomes. In addition, patients in this study with cerebellar infarctions showed more severely impaired non-REM sleep compared to patients with infarctions in other locations.

In conclusion, polysomnography studies in patients with CVA suggest that normal architecture of nocturnal sleep is

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