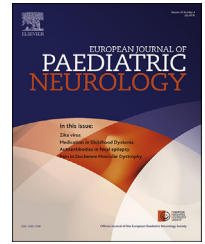




ELSEVIER

Official Journal of the European Paediatric Neurology Society



Original article

Yield of brain imaging among neurologically normal children with headache on wakening or headache waking the patient from sleep

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ARTICLE INFO

Article history:

Received 6 February 2018

Received in revised form

26 April 2018

Accepted 6 June 2018

Keywords:

Headache

Wakening

Sleep

Migraine

Tension-headache

ABSTRACT

Background: Headache on wakening (HoW) or sleep interruption secondary to headache (SIH) has been commonly regarded as a potential sign of raised intracranial pressure and therefore a sign of significant underlying pathology that necessitates further investigation. Current recommendations for neuroimaging in patients with HoW/SIH are neither consistent nor clear across headache guidelines published both nationally and internationally.

Aim: The main aim of this study was to ascertain the relevance of HoW and/or SIH as an indication for routine neuroimaging.

Methods: This study focused on clinically well patients with normal neurological examinations who had experienced HoW or SIH. Demographic and neuroradiological data were collected prospectively and the headache diagnosis was based on the International Classification of Headache Disorders.

Results: 102/1065 patients reported either HoW and/or SIH. There were 57/102 (56%) females, 45/102 males (44%), and 33/102 (32%) of ethnic minority. Their age ranged between 5 and 17 years. 79/102 (77%) patients with HoW, 19/102 (19%) with SIH and 4/102 (4%) with both HoW and SIH. Headache diagnosis included migraine ($n = 67$; 66%), tension type headaches ($n = 16$; 16%), medication overuse headaches ($n = 11$; 11%), and sinusitis ($n = 1$; 1%). Neuroimaging was performed in 101/102 patients; imaging was normal for 97 scanned patients, and showed non-significant abnormality in the remaining 4 patients.

Conclusion: HoW or SIH among clinically well and neurologically normal paediatric patients was most likely to be caused by primary headaches, particularly migraine or tension type headaches. This symptom alone among healthy and clinically well children is not an indication for routine neuroimaging and is unlikely to be caused by sinister aetiologies.

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<https://doi.org/10.1016/j.ejpn.2018.06.001>

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1. Section 1: Introduction

Headache on waking (HoW) or sleep interruption secondary to headache (SIH) have commonly been regarded as a potential sign of raised intracranial pressure. This symptom has been attributed to lying flat whilst sleeping which exacerbates raised intracranial pressure overnight.¹ Therefore HoW or SIH is often viewed as a “red-flag” symptom suggesting a sinister cause for the headache such as brain tumour or intracranial pathology. Due to the apparent connection between HoW/SIH and raised intracranial pressure, neuroimaging may be indicated to rule out underlying pathologies as a cause for the headache. However the current recommendation for neuroimaging in patients with HoW/SIH is neither consistent nor clear across published headache guidelines worldwide. This prospective study analyses hospital-based clinic data in children and adolescents to investigate the necessity of neuroimaging in reference to HoW/HWS as a red flag symptom. A review of current national and international guidelines was undertaken, looking at consensus on HoW/SIH as an indication for neuroimaging.

The International Headache society published an update of the International Classification of Headache Disorders in 2013 (ICHD-3 beta).² The ICHD-3 beta is not a clinical guideline per se but a definitive list of classifications which aid diagnosis and give specific direction for research. This guideline does however have some guidance regarding HoW/HWS or “hypnic headaches”: although the ICHD-3 beta does not go into detail it recommends ruling out any other causes that could be producing this symptom. Causes of headache on waking or headache waking an individual from asleep that need to be excluded include sleep apnoea, nocturnal hypertension, hypoglycaemia, medication overuse headache and intracranial disorders such as brain tumour or other space occupying lesions.

The European Headache Federation and the WHO (World Health Organisation) published a document for the management of common headache disorders in primary care in 2007, which includes warning features or “red flags” warranting referral from primary care and/or further investigation.³ This guideline advises investigations, including neuroimaging, are indicated when the history or examination suggest headache may be secondary to another condition (i.e. warning feature present). It must be noted that headache on waking is not included in the list of warning features. The European collaboration with the WHO can be compared to the NICE (National Institute for Health and Care Excellence) guidelines for diagnosis and management of headache.⁴ The NICE guidelines also have a list of “red flag features” in which headache on waking or headache waking patient from sleep is not included.⁴ Looking more closely at the NICE guidelines it is noted that “early morning headache” was a symptom that was under debate as to its significance. The NICE guidelines conclude that the seriousness or significance of any underlying pathology indicated by early morning headache is “uncertain”. This conclusion was drawn by the NICE guidelines when a literature search was conducted to answer the clinical question: “For young people and adults presenting with early morning headache, how common are

serious intracranial abnormalities?” and did not uncover any significant data on this topic.

This uncertainty surrounding headache on waking continues when looking at the British Association for the Study of Headache (BASH) guidelines from 2010.⁵ Morning headache is discussed in the warning features for this guideline and therefore warrants investigation however this includes “persistent morning headache with nausea” suggesting that morning headache in isolation is not a warning feature. Again these guidelines do not specify when neuroimaging is indicated but suggest when a patient needs a specialist referral or further investigation (which may include neuroimaging). Another set of headache guidelines originating from the UK is from the Scottish Intercollegiate Guidelines Network (SIGN).⁶ Headache on waking is a red flag in this guideline and specialist referral and further assessment is indicated if this symptom is present. As with other guidelines discussed, no specific imaging is mentioned as part of this further assessment. This guideline specifically states that neuroimaging is not indicated in patients with a clear history of migraine without red flag features for potential secondary headache and a normal neurological exam. One of the red flag features included is headache waking the patient but it is noted that migraine is the most frequent cause of morning headache. This could cause some confusion but it is presumably to make sure unnecessary neuroimaging in a clear migraine history is avoided.

The Journal of Headache and Pain published revised French guidelines for diagnosis and management of migraine.⁷ It is interesting to note that there are no references to headache on waking. The Croatian society for neurovascular disorders published updated primary headache guidelines in 2012.⁸ It may also be of note that headache on waking is mentioned in these guidelines in the general principles of migraine management and that migraine sometimes has the feature of headache on waking.

The search for US headache guidelines proved difficult. There were guidelines published in 2005 by the US Headache consortium for neuroimaging in patients with non-acute headache.⁹ This guideline does not, like other guidelines, include a list of red flag symptoms as it is specifically for non-acute headache. It therefore does not include in its remit headache presentations in emergency scenarios. In this guideline neuroimaging is indicated for non-acute headache and an unexplained abnormal finding on neurological examination. Neuroimaging is specifically not indicated in patients with migraine and normal neurological examination. Headache causing waking from sleep is mentioned in these guidelines and it is stated that this may indicate a higher likelihood of significant intracranial pathology. This is based on several small studies and the recommendation is that evidence is insufficient in order to draw any conclusion and give any indication for neuroimaging.

One of the most recent updates of headache guidelines comes from the Canadian Family Physician in 2015.¹⁰ This guideline is for primary care management of headache. It has a list of red flags and as with other national guidelines headache on waking is not included.

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