

External compression headache: A neglected headache

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External compression headache (ECH) is a scarcely studied headache. There are different possible causes, such as mechanical factors, hypoxemia, hypercapnia, or associated stress, or could even be a sum of these factors that lead to the origin of this headache. ECH is provoked by donning objects with tight bands or straps around the head and has been reported with the use of hats, helmets, frontal lux devices, headsets, goggles, and N95 face masks. At present, we are experiencing the pandemic caused by the severe acute respiratory syndrome by a coronavirus 2 (SARS-CoV-2), whose disease name is CoV disease 2019 (COVID-19). Due to this, the protection measures were extended among health care workers and the general population, such as the use of personal protective equipment (PPE), that will, expectedly, rise the incidence of this headache.

Headache due to external compression was incorporated into the international classification as external-pressure headache since the first edition of the International Classification of Headache Disorders¹. According to the ICHD-3 in the heading 4: other primary headaches, to which the ECH belongs, the diagnosis is made by meeting the following criteria: at least two episodes of headache, brought on by and occurring within 60 min during continued pressure from something outside your body, maximal pain at the site of compression, and resolving within 1 h after compression is relieved².

The pathogenesis of ECH is still uncertain. Depending on the personal accessory used, there are different possible causes or could even be a sum of factors that

lead to the origin of the headache. It could involve mechanical factors, hypoxemia, hypercapnia, or associated stress. The continuous pressure or tractional force from personal accessories may lead to local tissue damage and exert an irritative effect on the underlying superficial sensory nerves (trigeminal, occipital, and cervical nerves branches) that innervate the face, head, and cervical region³. Furthermore, the alveolar hypoventilation caused by prolonged use of face masks can lead to an increase in carbon dioxide with intra- and extracranial vasodilation (Fig. 1)^{4,5}.

ECH is provoked by donning objects with tight bands or straps around the head and has been reported with the use of hats, helmets, frontal lux devices, headsets, goggles, and more recently N95 face masks⁶. Besides, it is usually an occupational disease, because in different professions, the cause of the headache is the equipment they use to work, such as helmets or hats in policemen, firefighters, construction workers, military personnel, athletes, and aviation pilots, and the PPE that use the health care workers⁷.

Usually, the pain of ECH is described as moderate in intensity, not impeding routine activities, frequently constant, consistent with the use of the accessories, of oppressive quality, more severe at the area where the object is pressing and tends to increase with the longer exposure to the compressing object. The pain is not associated with other symptoms and disappears shortly after removing the cause³. In patients with a pre-existing headache, there are two possibilities: one is that the prolonged external compression may lead to a more

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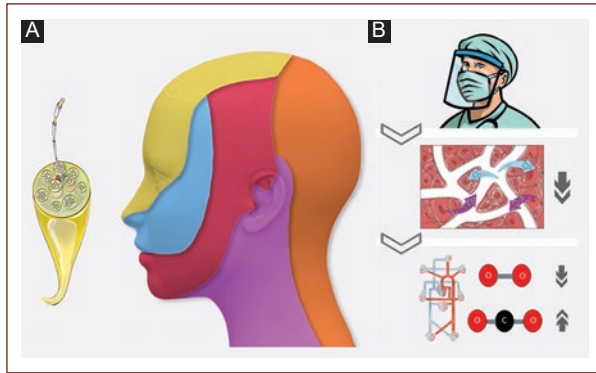


Figure 1. **A:** pressure or tractional forces from the objects may lead to local tissue damage and exert an irritative effect on sensory nerves (green area: ophthalmic nerve, blue area: maxillary nerve, purple area: mandibular nerve, yellow area: cervical nerves, pink area: superficial cervical plexus). **B:** prolonged use of face masks may lead to an alveolar hypoventilation that will cause hypoxemia and hypercapnia.

severe episode of the previous headache or that a *de novo* headache occurs with the previously described characteristics of ECH. For example, patients with previous migraine have reported the triggering of a more severe, pulsatile, unilateral headache with nausea/vomiting, photophobia, and phonophobia that did not end if the causal item was removed, requiring specific medical treatment⁸.

Because these attacks disappear when the pressure is removed, seeking medical attention is often postponed so this headache is under-recognized. The current treatment is based on education to remove frequently and temporarily the headwear or traction that causes the pressure. Educational materials could be beneficial. The possibility of trying different styles and sizes of headgear may be useful for some of these exposed subjects, to get the most comfortable option. Moreover, the prevention would be skipping headwear (should it be possible) if you are predisposed to ECH.

In recent years, we have witnessed epidemics involving different strains of influenza, SARS, and Ebola, transmitted by direct or indirect contact and/or the respiratory route; therefore, the use of PPE is mandatory to all the personnel involved in the care of patients⁹. PPE includes N95 face masks or surgical masks, protective eyewear such as goggles, medical gowns, and surgical gloves (sometimes double) for contact, and the use of the powered air-purifying respirators for all high-risk or aerosol-generating procedures. In daily medical

practice, it is required to wear PPE for prolonged periods. At present, we are experiencing the pandemic caused by the SARS-CoV-2, whose disease was baptized by the World Health Organization with the name of COVID-19¹⁰. Due to its high contagion rate, the widespread use of protective measures, such as PPE, will, expectedly, rise the incidence of this headache.

There are only three studies that demonstrate the association of the use of PPE with headache, facial pain, and/or ear lobe discomfort. The prevalence of PPE-associated headache varies from 37 to 81%, with a frequency of > 6 episodes/month in 33%. About 81-88% reported the onset with < 60 min of use and 88% reported the end of the episode with equipment removal. The pain has been bilateral in all the patients; 87% reported as oppressive followed by 11.7% as throbbing quality, and its intensity was mild in 72%. Even when 83% reported a negative impact on their work performance, only 7% took a sick leave because of headache, and 31-59% required the use of abortive analgesics. It is important to take into account the presence of pre-existing headache, which was reported in 29-37%; among these patients, 91% reported an increase in the frequency and duration of episodes and poorer work performance. The two individual factors that increase the risk of developing PPE-associated headache are the existence of a previous headache, such as migraine and tension-type headache, and a longer period of usage, usually > 4 h/day^{8,11,12}.

In future, it will be indispensable to prepare specific protocols for situations like these, since in addition to the protection of hospital staff, it is necessary to think of their comfort as well. There are two approaches that could be exploited: one is directed to the PPE, by inviting manufacturers to look for alternatives, either in materials or shapes that reduce the possibility of discomfort to their users (one example was a fighter pilot that suffered from ECH from his helmet; the successful treatment was the switching of the non-adjustable one-piece helmet to a two-piece adjustable helmet, this measure disappeared the headache)¹³ and the second possible contribution would be to modify the infrastructure and policies of hospitals, shortening working periods, rotating periods in different hospital areas, where personnel can rest without the equipment and decrease the period of exposure.

Conflicts of interest

The authors declare no conflicts of interest.

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Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that no patient data appear in this article.

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