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Hyperventilation Syndrome Following an Asymptomatic COVID-19 Infection

Síndrome de Hiperventilação Após uma Infeção COVID-19 Assintomática

Keywords: COVID-19; Hyperventilation
Palavras-chave: COVID-19; Hiperventilação

Hyperventilation syndrome (HVS) is characterized by a variety of symptoms induced by inappropriate breathing patterns, namely excessive ventilation.[1,2]

A 33-year-old woman with no comorbidities, occasional smoker, was evaluated at our clinic due to a six-month history of dyspnea (mMRC 3), chest tightness, and severe fatigue that started after the self-isolation period following an asymptomatic coronavirus disease 2019 (COVID-19) infection in January 2021. She also described episodes of anxiety, palpitations, lower limb paresthesia and blurred vision. On physical examination, the patient was tachypneic at rest (RR 32 - 36 bpm). She scored 35/64 in the Nijmegen questionnaire (a score above 23/64 is suggestive of hyperventilation syndrome).

The arterial blood gas analysis at rest revealed respiratory alkalosis (pH 7.506, pCO_2 23.6 mmHg; normal pH: 7.35 - 7.45, pCO_2: 35 - 45 mmHg). On the six-minute walk test (6MWT), she experienced severe dyspnea [end BORG dyspnea level (0 - 10): 10], chest tightness and lower limb paresthesias; the test was ceased at 3 minutes 27 seconds, after 168 meters, with no significant oxygen desaturation and normal cardiac response. Complete blood work – including autoimmunity testing, thyroid and kidney function, serum electrolytes, cardiac biomarkers, and HCG test – was normal. Pulmonary function tests and a chest radiograph revealed no significant changes. A thoracic computed tomography (CT) scan angiography excluded the presence of a pulmonary thromboembolism, and a ventilation/perfusion scan showed no significant mismatch. The patient performed an electrocardiogram which was unremarkable. A transthoracic echocardiogram was considered normal (LVEF 71%; PSAP 27 mmHg), as well as the myocardial perfusion scintigraphy and the cardiac magnetic resonance imaging (MRI). The patient also performed a cardiopulmonary exercise test, which revealed an exercise limitation (maximum VO2 7.1 mL/kg/min, 31% predicted), with an adequate gas exchange and cardiovascular response.

A diagnosis of post-COVID-19 HVS was suspected. The patient entered a pulmonary rehabilitation program, with aerobic exercises, respiratory muscle training, and psychological reconditioning. She experienced an improvement in her quality of life [initial EuroQoL (EQ)-5D 11/15; final EQ-5D: 7/15] and a satisfactory response on the last 6MWT performed – 462 m of distance walked (77% predicted). A re-evaluation arterial blood gas analysis performed at rest revealed a mild hypocapnia (pCO_2 33.2 mmHg; normal pCO_2: 35 - 45 mmHg). Due to the favorable response to the rehabilitation program, a referral to psychiatry assessment was not considered.

The combination of the Nijmegen score and Cardiopulmonary exercise is used to establish a diagnosis of HVS.[1] Following a COVID-19 infection, ruling out thrombotic lung disease and myocarditis is important.[3] Regarding pathophysiology, hypocapnia and anxiety seem to play an important role in the development of symptoms.[4] In patients with post-COVID-19 HVS, it has been suggested that inflammatory and/or microangiopathic changes in the pre-Bötzinger complex, a part of the ventral respiratory group of interneurons responsible for the control of breathing and the response to hypoxia, may lead to the dysregulation of the ventilatory drive. Respiratory rehabilitation is usually recommended for symptom management.

This is, to the best of our knowledge, the first report of a case of post-COVID-19 HVS in Portugal. As this is a rare disorder, clinical awareness is required to identify this often-missed manifestation of post-COVID-19.

AUTHOR CONTRIBUTIONS

IC: Writing of the manuscript.
AC, CR: Critical review of the manuscript.
FC: Conception and critical review of the manuscript.

PROTECTION OF HUMANS AND ANIMALS

The authors declare that the procedures were followed according to the regulations established by the Clinical Research and Ethics Committee and to the Helsinki Declaration of the World Medical Association updated in 2013.

DATA CONFIDENTIALITY

The authors declare having followed the protocols in use at their working center regarding patients' data publication.

PATIENT CONSENT

Obtained.

COMPETING INTERESTS

The authors have declared that no competing interests exist.

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'Déjà Vu', a Mind Trick or a Warning Sign? A Case Report

'Déjà Vu', um 'Truque Mental' ou um Sinal de Alarme? Um Caso Clínico

Keywords: Adolescent; Déjà vu; Ganglioglioma/diagnosis
Palavras-chave: Adolescente; Déjà vu; Ganglioglioma/diagnóstico
Microbiana

Dear Editor,

The *déjà vu* (DV) phenomenon is a dissociative experience defined as the feeling of having already witnessed or experienced a current situation.[1] It is an established symptom in temporal lobe seizures and is also associated with disruptions in the prefrontal cortex or hippocampus, although its etiology is still unclear.[1]

We present the case of a 16-year-old male admitted to the emergency department due to an abnormal breathing pattern observed during sleep, followed by a lack of response upon stimulation. This only lasted a few seconds, and the patient developed lethargy, headache, and vomiting afterwards.

The patient mentioned having frequent episodes of DV, two to three times a day, that started two years before.

Since the clinical examination, computed tomography scan, and blood tests were normal, the patient was discharged to the outpatient pediatrics clinic, where he was observed one month later. There, he reported persistence of the DV episodes, but now with multiple episodes per day (about five to six), lasting for a few minutes and accompanied by headaches. There were no episodes of loss of consciousness or seizures. The patient denied dissociative symptoms – disruptions in the sense of self-identity, consciousness, memory, or perception of reality.

After the previous normal electroencephalogram (EEG), a brain magnetic resonance imaging (MRI) was performed, which found an expansive cortico-justacortical lesion on the median temporal right region, suggesting a diagnosis of ganglioglioma (Fig. 1).

The patient was referred to both Oncology and Neurosurgery clinics in our tertiary referral hospital, where biopsy and genetic testing were performed for tumor characterization.

The histopathological examination confirmed a glioneuronal tumor – WHO grade 1: low-grade ganglioglioma (GG).

The patient underwent tumor resection surgery, with successful removal of the tumor. He is now well and does not have any sequelae, as demonstrated by magnetic resonance imaging (MRI), electroencephalography (EEG), and an adequate performance in neuropsychological tests.

Ganglioglioma is a rare mixed neuronal-glial neoplasm, accounting for 0.5% - 5.0% of all pediatric central nervous system tumors. These are most common in the first two decades of life, affecting predominantly male patients with a median age of 12 years.[2]

Gangliogliomas are composed of neoplastic mature ganglion cells in combination with glial cells,[3] can be located anywhere on the neuraxis, but are usually located on the