**When Breath Becomes Air: An Unfortunate Case of A Brainstem Tumour with Conscious Central Neurogenic Hyperventilation**

Ooi Tze Siang1; Ng Jen Siang1; Alzamani Mohammad Idrose1

*1 Emergency Department, Hospital Kuala Lumpur, Wilayah Persekutuan Kuala Lumpur, Malaysia*

**Introduction**

Cardiorespiratory causes of dyspnoea are commonly encountered in emergency department (ED), however recognising central causes of tachypnoea can be challenging.

**Case Description**

A 31-year-old gentleman presented with breathlessness for the past 1 month. Clinically patient was tachypnoeic with irregular, deep breathing, with a normal lung findings and oxygen saturation. Arterial blood gas showed respiratory alkalosis with no hypoxemia. Upon further history, he had history of double vision 4 months earlier and subsequently underwent magnetic resonance imaging (MRI) which reported a brainstem lesion likely high-grade glioma. His tachypnoea persisted despite being sedated and was eventually intubated in view of anticipated clinical deterioration. During admission, repeated MRI brain showed diffuse expansile lesion of midbrain and pons with worsening extension to hypothalamic region and left cerebellar with mass effect and mild hydrocephalus. He was treated with intravenous dexamethasone and was extubated with improving tachypnoea. Biopsy was not done in view of deep-seated lesion; thus, a presumptive diagnosis of high-grade pontine glioma was made. He was discharged with oral prednisolone and was later started on radiotherapy.

**Discussions**

Tachypnoea without hypoxemia should raise suspicion towards non-cardiorespiratory causes of tachypnoea. Recognising breathing patterns may help in differentiating them. Hyperventilation describes an abnormal increase in breathing rate and depth, leading to hypocapnia1. Central neurogenic hyperventilation (CNH) is hyperventilation that persists during sleep, low arterial PaCO2, high arterial PaO2, and high arterial pH in the absence of drug or metabolic causes with scarce literature2. CNH caused by central nervous system (CNS) neoplasm are majority lymphoma (45%) and gliomas (39%) involving the pons and the medulla have consistently been described3. Mechanism of infiltrative pontine lesions causing CNH is poorly understood but plausible theories are due to stimulation of intrinsic respiratory control centres4. CNH can be aborted by definitive treatment of the underlying neoplasm. Steroids, opioids and sedatives are shown to have variable outcomes3.

**Conclusions**
Clinicians must have high index of suspicion of alternative diagnoses in tachypnoea with normal lung findings and saturation, including neurological pathology. Recognising breathing pattern may aid in diagnosis of undifferentiated tachypnoea.

**Keywords**

Central Neurogenic Hyperventilation, Pontine Glioma

**References**

1. Lacey Whited; Muhammad F. Hashmi; Derrel D. Graham. Abnormal Respiration PMID: **29262235** Bookshelf ID: [NBK470309](http://www.ncbi.nlm.nih.gov/books/nbk470309/)
2. Plum  Fswanson  AG Central Neurogenic Hyperventilation In Man.  AMA Arch Neurol Psychiatry 1959 May;81(5):53549. Doi:10.1001/Archneurpsyc.1959.02340170001001.
3. Neves Briard J, Beaulieu MC, Lemoine É, Beaulieu C, Dubé BP, Lapointe S. [Central Neurogenic Hyperventilation In Conscious Patients Due To CNS Neoplasm: A Case Report And Review Of The Literature On Treatment.](https://pubmed.ncbi.nlm.nih.gov/33014397/) Neurooncol Pract. 2020 Apr 10;7(5):559-568. Doi: 10.1093/Nop/Npaa016.
4. [Andrew W. Tarulli, MD](https://jamanetwork.com/searchresults?author=Andrew+W.+Tarulli&q=Andrew+W.+Tarulli); [Chun Lim, MD, PhD](https://jamanetwork.com/searchresults?author=Chun+Lim&q=Chun+Lim); [Jonathan D. Bui, MD, PhD](https://jamanetwork.com/searchresults?author=Jonathan+D.+Bui&q=Jonathan+D.+Bui); et al: Central Neurogenic Hyperventilation A Case Report and Discussion of Pathophysiology *Arch Neurol.*2005;62(10):1632-1634. doi:10.1001/archneur.62.10.1632