Biot's breathing associated with acute bacterial meningitis in a child

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DESCRIPTION

A 19-month-old boy presented to the emergency room of our hospital with fever and drowsiness following asymmetric focal seizure. On examination the patient was somnolent, had signs of meningeal irritation and intermittent nystagmus. Laboratory examination revealed increased C-reactive protein (200 mg/L), procalcitonin (25.9 ng/mL) and hyponatraemia (132 mEq/L). The initial CT of the brain was normal. Given presumed meningoencephalitis, intravenous dexamethasone, vancomycin, ceftriaxone and acyclovir treatment was started, and the child was admitted to the paediatric intensive care unit. Several hours after the admission, irregular, jerky respirations appeared, consistent with Biot's breathing (figure 1). The patient developed hypertension (129/90 mm Hg) and relative bradycardia (90 bpm). Due to these signs, consistent with increased intracranial pressure, lumbar puncture was deferred and the child received mannitol with notable improvement in his condition. On hospital day 2, lumbar puncture revealed turbid fluid with an opening pressure of 5 cmH₂O, white blood cells 340/μL and red blood cells 1700/μL. BioFire FilmArray Meningitis/Encephalitis panel

detected *Streptococcus pneumoniae* DNA, and the blood culture grew *S. pneumoniae*. On day 3 of hospitalisation, left hemiparesis and feeding difficulties developed with recurrence of focal seizures controlled by midazolam and phenytoin. His condition improved gradually and he was transferred to the paediatric ward on hospital day 5. Brain MRI revealed multiple foci in temporal lobe white matter and numerous bilateral cortical and subcortical microbleeds, compatible with vasculitis (figure 1). The child continued a 4-week course of ceftriaxone and anticonvulsive therapy (carbamazepine and levetiracetam). The auditory brainstem response examination showed severe bilateral hearing loss. Five weeks after the initial admission the patient was transferred to the paediatric rehabilitation facility, and he subsequently received a cochlear implant. After extensive rehabilitation, the patient had almost complete resolution of all deficits except hearing.

Camille Biot made his observations on breathing patterns in 1875 while describing a patient with tuberculous meningitis.¹ He distinguished this pattern from previously described Cheyne-Stokes breathing and named it 'meningitic rhythm'. In

Figure 1 Top images: Axial T2-fluid-attenuated inversion recovery (FLAIR) (A), contrast enhanced T1 (B) and susceptibility-weighted imaging (SWI) (C) MRI scans showing cortical and subcortical hyperintensity in the right temporal lobe (black arrows in A) with multiple foci of patchy ring-like enhancement in temporal lobe white matter (dotted arrows in B) and numerous bilateral cortical and subcortical microbleeds (white arrows in C), compatible with vasculitis. Bottom image: 'Biot's breathing' on paediatric intensive care unit (PICU) monitor.

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Images in...

contrast to Cheyne-Stokes breathing, the respirations of Biot's breathing pattern lack the crescendo-decrescendo 'diamond-shaped' cycles. The original publication by Biot described irregular respirations with alternating depth and without any constant pattern, but over the years semantic confusion developed, and the terms 'Biot's breathing', 'cluster breathing' and 'ataxic breathing' were erroneously used interchangeably.² The appropriate current term for the pattern originally described by Biot is 'ataxic breathing', which is associated with a medullary lesion and may be a warning sign of brainstem compression. In our case, 'Short-cycle periodic breathing' is a more accurate term.³ This breathing pattern is seen with increased intracranial pressure, opioid intoxication, lower pontine lesions or expanding lesions

in the posterior fossa.³ Although the term 'Biot's breathing' can be found in textbooks on physical examination and physiology, and even on Wikipedia, there are only rare mentions of Biot's breathing in clinical literature, most frequently in the context of meningitis.

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Learning points

- 'Biot's breathing' is a term rarely used today that describes an abnormal respiration pattern. Biot's breathing occurs when periods of apnoea alternate irregularly with series of breaths of equal depth that terminate abruptly, and is associated with meningitis.
- The use of historical eponyms is widespread, but descriptive terms often are more precise.
- Any deviation from normal breath pattern associated with central nervous system damage is a foreboding clinical sign.

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