

Hematic Cortisol and Craniofacial Morphology in Children with OSAS

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Commentary

Obstructive sleep apnoea syndrome (OSAS) is a common problem in children [1]. There is evidence suggesting that nocturnal awakenings in OSAS are associated with alterations in Hypothalamic-Pituitary-Adrenal (HPA) activity, specifically, increased pulsatile cortisol release [2]. Cortisol is the primary human glucocorticoid product of the HPA axis and major functions include metabolic and blood pressure regulation and immune suppression. Excess cortisol secretion is associated with numerous adverse systemic consequences, such as metabolic syndrome, diabetes, hypertension, depression and insomnia [3]. The circadian rhythm of secretion of cortisol is strongly related to sleep, an altered regulation of cortisol levels has been proposed as a mechanism through which sleep disorders manifest some of their pathologic effects [4]. The human endogenous, CNS (Central Nervous System)-controlled cortisol circadian rhythm is characterized by cortisol levels begin to rise about 2–3 h after sleep onset and a continuous arousal during the early waking hours.

In literature nocturnal awakenings have been associated with pulsatile cortisol release and autonomic activation leading to an increased release of catecholamine, Corticotropin-Releasing Hormone (CRH) and cortisol. OSAS seems to cause activation of the HPA axis through a similar mechanism of autonomic activation, awakening, and arousal [5,6]. HPA axis hyperactivity can have many negative effects on sleep. It can lead to sleep fragmentation, decreased Slow-Wave Sleep (SWS), and shortened sleep time. Likewise, OSAS can exacerbate HPA axis dysfunction, worsening the cycle [3]. In growing subjects, chronic obstructive airway disease is often associated with disorders of orthodontic interest [7-10]. In this field several studies have been conducted but the nature of the anatomical and functional relationships between respiratory and dental apparatuses make it difficult to understand how the dysfunctions interact. It has been a matter of discussion to ascertain whether the craniofacial alterations are a cause or, a consequence of increased resistance to oronasal airflow. Harvold in 1981 showed the presence of cranial and muscle alteration in growing primates in which oral breathing was experimentally induced for an extended period of time [11].

Physiological breathing seems to play an active role in harmonious craniofacial development, therefore, when external factors alter its balance functional and craniofacial alterations can be observed. The most evident consequences of chronic nasal obstruction are represented by orofacial alterations related to an abnormal mandible displacement and a subsequent dysmorphism of the oral structures leading to a modified posture [8].

The aim of this preliminary study was to evaluate correlations between haematic cortisol levels and the craniofacial morphology in children diagnosed with OSAS, in comparison with a group of healthy children. In this case-control study children referring to the Paediatric Department, University of Insubria with a history of disturbed sleep

were evaluated and 28 children, compliant to our criteria, were enrolled. All patients underwent a full-night polysomnographic evaluation. Haematic cortisol levels were estimated using radioimmunoassay. An orthodontic evaluation and a cranial lateral cephalometric analysis were performed. Haematic cortisol concentration at 2.00 AM was found higher in OSAS patients than in controls. The alteration of nocturnal cortisol levels might be important not only for the effects, mentioned above, that this hormone exerts on sleep, but also for the inhibitory activity that cortisol exerts on the secretion of the Growth Hormone (GH). It is known that elevated cortisol levels cause a reduction in the secretion of GH [12]. Moreover, since the peak of GH secretion occurs during SWS, OSAS itself, causing shortened SWS time, could cause an altered GH secretion. In fact, in literature it has been reported that children with obstruction of the upper airway show growth defects due to a reduced secretion of GH, which is restored after adenotonsillectomy [13]. In particular, in subjects with deficient GH secretion a reduced posterior facial height was found, when compared to healthy controls of the same age, due to a reduced growth of the ramus. Other studies have reported that administration of GH in these patients lead to an accelerated growth of the mandibular ramus. Hence, if the obstruction of the upper airway can represent, through the modified tongue position and the consequent stretching of the soft tissues, a mechanical cause in the development of craniofacial alterations, it can be hypothesized that an increased nocturnal secretion of cortisol in OSAS patients could provide a metabolic cause. Altered HPA axis activity and craniofacial modification are often found in OSAS children. We are not able to state whether if these conditions are causes rather than consequences of OSAS. It seems that they both present self-perpetuating vicious cycles: in the former sleep fragmentation increases cortisol levels [2] and in this increased HPA axis activity promotes sleep fragmentation itself [14], in the latter it is difficult to establish if the primary alteration is respiratory or maxillofacial [7-8]. Furthermore, due to the reduction of GH secretion caused by cortisol and sleep fragmentation, it can be assumed that, in OSAS subjects, the alteration of facial morphology may also have a metabolic cause. Independent of the primary cause of these vicious cycles a multidisciplinary approach to OSAS children should be advisable. The altered hypothalamic-pituitary-adrenal activity and the craniofacial modification are not enough to state if these conditions

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are causes or consequences of OSAS. Furthermore, as cortisol and sleep fragmentation may cause a reduction of growth hormone secretion, it is possible that the alteration of facial morphology may also have a metabolic cause.

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