H129 Cranial Hyperostosis and Neuropsychiatric Disorders: Is There a Correlation? A Comparison Between Forensic Cases and a Review of Literature

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Learning Overview: After attending this presentation, attendees will understand the role of frontal hyperostosis in the genesis of neuropsychiatric disorders.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by demonstrating the need to investigate the role of hyperostosis as a potential association and predictive factor of neuropsychiatric diseases.

Cranial hyperostosis is an idiopathic condition characterized by an increase in skull thickness. Frequently, it involves the frontal bone and the anterior fossa. Hyperostosis, and particularly Hyperostosis Frontalis Interna (HFI), has been described in association with psychosis, depression, Parkinsonism, executive function disorders with memory loss, and inappropriate behavior. Only case reports are published in forensic literature. A correlation has been hypothesized with the so-called Morgagni-Stewart-Morel (MSM) syndrome, characterized by HFI and metabolic and neuropsychiatric disorders.[1] However, to date, there is no general agreement on the existence of the MSM syndrome as the pathogenesis of the phenomenon remains unclear.

The aim of this study is to examine the possible correlation between cranial hyperostosis and neuropsychiatric disorders, comparing the published literature to the findings in three forensic autopsy cases. In each case, the morpho-volumetric analysis of bone structure and brain was performed at autopsy (i.e., measuring thickness of the skull, diameters of the cavities, presence of bone spurs, weight and size of the brain, thickness of the cortex, and brain analysis by Virchow cutting). Toxicologic analysis was performed. An investigation was carried out regarding previous hospitalizations and psychiatric disorders, incorporating information from family doctors and psychiatrists. Finally, a literature search was performed utilizing the PubMed® National Center for Biotechnology Information (NCBI) search engine and the key words “cranial hyperostosis” and “psychiatry” OR “psychiatric disorders.” Obtained literature was reviewed.

Case 1: A woman suffering from diabetes and schizoaffective disorder (depressive type) suffered an exacerbation of delirium, hallucinations, and dysphoria over the past few months. She required assistance, support, and continuous reassurance from physicians; she was not reliable and was unable to function effectively independently. She died following a suicidal fall from a height. At autopsy, HFI was noted with the presence of multiple, diffuse bone spurs, located in the anterior cranial fossa, which protruded toward the brain. The absence of fractures was due to greater resistance of the bone structure of the skull. The brain weighed 1,090 grams with softening areas and punctiform hemorrhagic areas on the thalami and the cerebellum.

Case 2: A woman suffering from severe dementia and diabetes was admitted with a pertrochanteric fracture of the left femur after an accidental fall. Reportedly, her dementia had diminished her cognitive abilities significantly enough that it compromised her ability to perform daily activities. She died due to massive pulmonary embolism following the femur fracture. At autopsy, frontal cranial hyperostosis was noted. The brain showed a flattening of the cerebral convolutions and a reduction in the thickness of the cortex (1,040 grams).

Case 3: A man was found dead due to a suicidal gunshot injury. At autopsy, Diffuse Cranial Hyperostosis (HCD) was evident with an overall reduction in brain volume (approximately 1,000 grams). There was a large subarachnoid and intracerebral hemorrhage due to the firearm. His clinical history was significant for depression with suicidal ideation.

These cases highlight disorders arising in the context of hyperostosis, including prefrontal syndrome, depression, and neurodegenerative diseases (dementia). These disorders coincide with those described in the literature, except for suicidal behavior.[2-3] Literature review showed that the potential role of frontal hyperostosis in the genesis of neuropsychiatric disorders so variable in their etiology, pathophysiology, and symptoms is still controversial. The most accepted hypothesis is that an abnormal release of hormones (e.g., estrogens) has a decisive role in the genesis of a “neurometabolic” syndrome. The overproduction of estrogens results in the growth of frontal bone (a known hormonal target), neuropsychiatric disorders, and metabolic diseases with greater prevalence in women.[1] In the current study, two of the three reported cases involved women suffering from diabetes. Additionally, the growth of sharp bone spurs on the endo-cranium could also exert a “disturbing” role on the frontal and prefrontal lobes, contributing to the prefrontal syndrome associated with the hyperostosis. In the context of neurodegenerative disorders, literature review also showed a correlation between HFI and a decrease in brain volume.[4] The current study illustrates the need for a statistical large-scale collection of anatomic data in psychiatric patients. Such a survey could prove critical in establishing structural anatomical data as a potential predictor of psychiatric disorders, such as prefrontal syndrome, dementia, and depression with suicidal ideation.

Reference(s):

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