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Parietal foramina and relationship to syndromic and non-syndromic craniosynostosis

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Objectives: Parietal foramina (PFM) are congenital calvarial abnormalities that cause symmetrical paired round defects in the upper posterior angle of the parietal bones. Mutations in MSX2 and ALX4, are thought to lead to abnormal ossification causing isolated enlarged PFM; however there are several reports describing the association of PFM with craniosynostoses. In this study, we ascertain the incidence and size of PFM in all patients with syndromic and non-syndromic craniosynostoses.

Design: Retrospective Cohort Study.

Subjects: All patients diagnosed with craniosynostoses from 2001 onwards, presenting to Birmingham Children's Hospital.

Methods: The 3D CT images of all patients were examined for the presence and size of PFM using PACS software. The occurrence of other foramina and ossification defects was also noted.

Results: A total of 474 patients with 3D CT images were found. 64 children (13.5%) had syndromes (Apert's, Crouzon's, Muenke's, Pfeiffer's, Saethre-Chotzen) and 410 (86.5%) were non-syndromic cases of craniosynostosis. PFM were observed in 13 (20.5%) syndromic and 20 (4.9%) non-syndromic children giving a risk ratio of 3.4 (95%CI 2.075 – 5.5921), Odds ratio of 4.97 and Fisher's $p<0.00010$. Pfeiffer's 75% (3/4) of and Saethre-Chotzen 62% (8/13) showed the highest frequency. In addition, occipital foramina were also present in 15 (23.4%) syndromic and 22 (5.4%) non-syndromic children.

Conclusions: There is an overall incidence of foramina in craniosynostoses of 13.3%. Parietal foramina occurred in 7% with its incidence being 5 times greater in syndromic cases. Future work includes genetic studies of patients with PFM and follow-up to establish syndromic associations and clinical correlations including raised ICP.