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A combined manual and AI-driven approach to identifying morphometric predictors for posterior cranial fossa decompression surgery in children with Chiari Malformation Type I and autism spectrum disorder

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Posterior cranial fossa (PCF) decompression surgery (PCFDS) is currently suggested in symptomatic Chiari Malformation-I (CM-I). According to few papers (Jayarao et al. 2015), patients with CMI-I and Autism (ASD) may improve their cognitive and behaviour profile after PCFDS.

The aim of this study is to identify patients' PCF morphometric parameters as predictive factors of ASD outcome after PCFDS by AI application.

Ten children with CM-I and ASD submitted to extradural PCFDS were evaluated. The average age and follow up were respectively 7,5 and 4 years while the male/female ratio was 70%.

Eleven morphometric measurements from MRI scans were analyzed using a MATLAB-based algorithm. ASD symptoms were assessed through phone interviews under Child Neurologist's supervision.

Patients with a reduced tentorium angle width showed no post-surgical improvement of their ASD profile, while those with a wider angle did.

AI analysis identified a tentorium angle of 89.55° as the threshold differentiating these groups, with 93.3% accuracy. No appreciable differences were detected when including other parameters: cerebellar tonsils

descent, tentorium length, ratio between cerebellum/PCF areas, ratio between PCF/brain areas, height of PCF, antero-posterior diameter of foramen magnum, distance between corpus callosum and foramen magnum, distance between pons and foramen magnum, distance between fastigium and foramen magnum and length of the clivus.

This study highlights the tentorium angle width as a valuable indicator for guiding neurosurgeons in surgical decision-making for this patient group.