

The Human Cisterna Magna: Anatomical Variations and Clinical Significance

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**Introduction:** Goals were to describe the anatomical characteristics of the cisterna magna (CM), develop a concise classification system for CM variants, evaluate the clinical significance of specific CM types, and relate these findings to Chiari malformation.

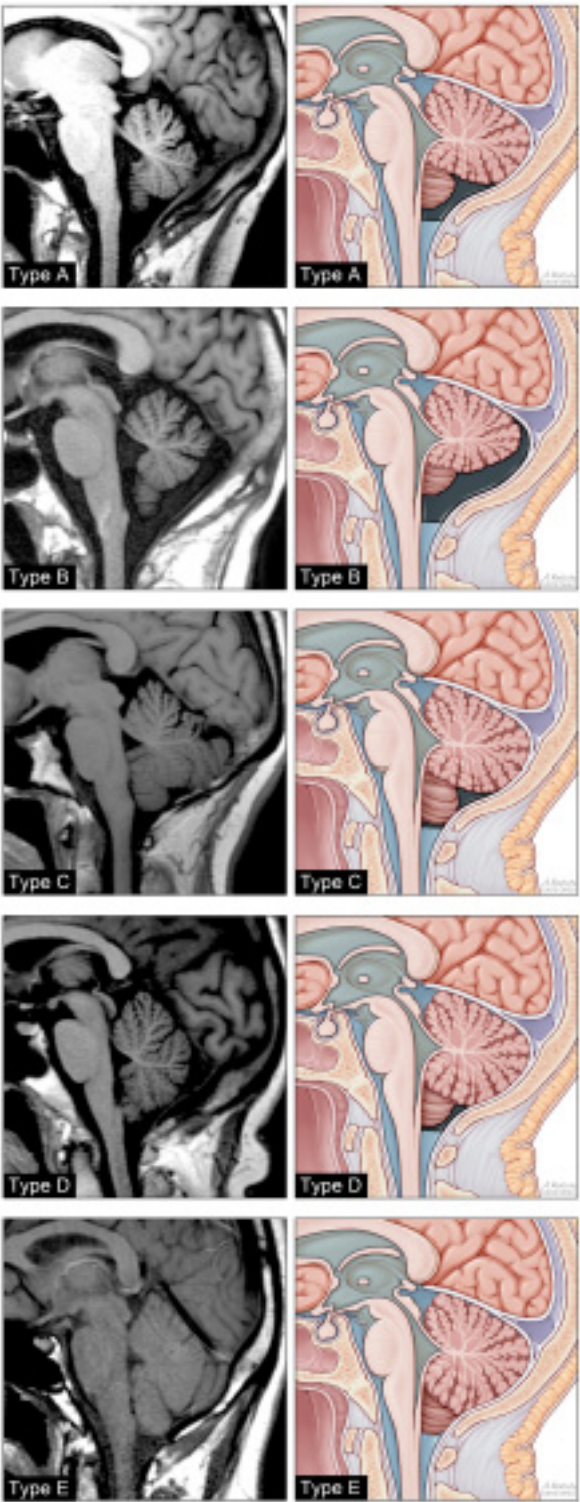
**Methods:** 523 consecutive MRI scans obtained for any reason were reviewed. Cisterna magna variants found in the study population were categorized and analyzed in respect to CM type, cerebrospinal fluid (CSF) compartment dimensions, and tonsilar descent. These were related to clinical findings.

**Results:** 268 subjects were female and 255 were male. CM volume was smaller and three times more likely to be absent in females. CSF anterior to the brainstem correlated with CM volume. CM Types A through E were described. Type A was most frequent. 132 subjects had Types C, D, and E, characterized by no connection between the CM and cervical spine CSF (Type C), minimal CM volume (Type D), or no CM at all (Type E). 35% (7/20) of subjects with CM Types C, D, or E, tonsils in or descended 5mm or less through the foramen magnum, and 3mm or less CSF anterior to the brain stem had Chiari-like symptoms as the reason for obtaining an MRI. This compares to subjects with CM Types C, D, or E, tonsils in or descended 5mm or less through the foramen magnum, and 4mm or more CSF anterior the brainstem, of which only 10% (5/48) had Chiari-like symptoms.

**Conclusions:** This anatomical description and simple classification system allows for precise description of posterior fossa anatomy and a reproducible method of evaluating potential pathophysiology. Relying only on the degree of tonsillar descent for the diagnosis of Chiari may ignore the significant impact other variations have on Chiari-like pathology. Evaluating outcomes with this classification system will improve understanding of Chiari anatomy and management.

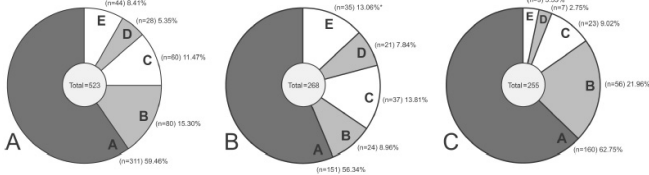
**References:** Yasargil M (1987) Microneurosurgery: Microsurgical Anatomy of the Basal Cisterns and Vessels of the Brain, Diagnostic Studies, General Operative Techniques and Pathological Considerations of the Intracranial Aneurysms. In, vol I. Thieme, New York, p 52. Sekula RF, Jr., Jannetta PJ, Casey KF et al (2005) Dimensions of the posterior fossa in patients symptomatic for Chiari I malformation but without cerebellar tonsillar descent. Cerebrospinal Fluid Res 2:11.

Cisterna Magna Types



The 5 types of the human cisterna magna found in our review of 523 MRI scans obtained for any reason at our institution.

Cisterna Magna Type and Gender Distributions



Distribution pie charts, data grouped by type of cisterna magna. A: total study distribution, B: female subject distribution, and C: male subject distribution. Distributions were significantly different between genders (chi-square 38.39, df 4,  $p < 0.0001$ ). The difference between females and males with a CM Type E was significant (chi-square 15.40, df 1,  $p < 0.0001$ ).

Clinical and Imaging Criteria for Symptomatic Patients

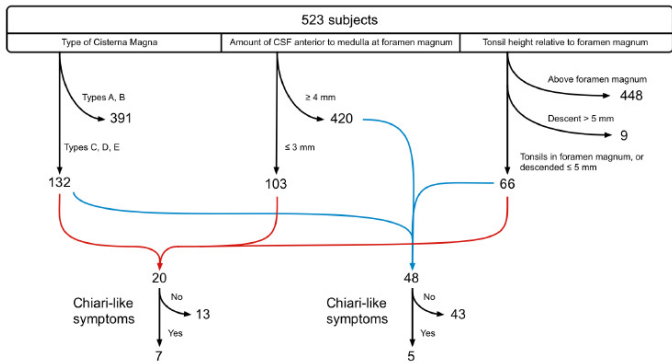


Diagram showing number of subjects meeting all three criteria. These groupings suggest that careful attention should be given to subjects with tonsillar descent less than 5mm but who meet these three criteria.