Basilar invagination without atlantoaxial dislocation

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While basilar invagination and atlantoaxial dislocation are often seen together, it is possible to have basilar invagination without atlantoaxial dislocation. In these cases, the upward movement of the skull base is caused by other factors such as abnormalities in the shape or structure of the skull or bones of the neck.

The symptoms of basilar invagination without atlantoaxial dislocation may be similar to those of basilar invagination with atlantoaxial dislocation and can include neck pain, headaches, weakness, and difficulty with balance and coordination. Treatment for basilar invagination without atlantoaxial dislocation may involve medications to manage symptoms, physical therapy to improve strength and coordination, and surgery to relieve pressure on the brainstem and spinal cord. The specific treatment plan will depend on the severity of the condition and the individual's symptoms.

Classification

Type I: Basilar invagination with no associated malformation. In this type, the tip of the odontoid process (a bony projection from the axis vertebra) is above the Chamberlain's line (a line drawn from the posterior margin of the hard palate to the posterior rim of the foramen magnum).

Type II: Basilar invagination with associated Chiari malformation. In this type, the tip of the odontoid process is above the Chamberlain's line, and there is downward displacement of the cerebellar tonsils into the foramen magnum.

Type III: Basilar invagination with associated platybasia. In this type, the odontoid process is not elevated above the Chamberlain's line, but the clivus (the sloping surface of the occipital bone) is flattened.

Atlanto-occipital instability (AOI) is common in patients with type II basilar invagination (II-BI).

Computed tomography data from 185 adults (80 controls, 63 CM, and 42 CM + II-BI) were collected, and geometric models were established for parameter measurement. Canonical correlation analysis was used to evaluate the morphological and positional relationships of the atlanto-occipital joint (AOJ).

Among the 3 groups, the length and height of the condyle and superior portion of the lateral masses of the atlas (C1-LM) were smallest in CM + II-BI cases; the AOJ had the shallowest depth and the lowest curvature in the same group. AOJs were divided into 3 morphological types: type I, the typical ball-and-socket joint, mainly in the control group (100%); type II, the shallower joint, mainly in the CM group (92.9%); and type III, the abnormal flat-tilt joint, mainly in the CM + II-BI group (89.3%). Kinematic computed tomography revealed AOI in all III-AOJs (100%) and some II-AOJs (1.5%) but not in type I-AOJs (0%). Morphological parameters of the superior portion of C1-LM positively correlated with those of C0 and the clivus and significantly correlated with AOI.

Dysplasia of the condyle and superior portion of C1-LM exists in both CM and II-BI cases yet is more obvious in type II-BI. Unstable movement caused by AOJ deformation is another pathogenic factor in patients with CM + II-BI [1)]

1)

Huang Q, Yang X, Zheng D, Zhou Q, Li H, Peng L, Ye J, Qi S, Lu Y. Exploring the Pathogenesis of Atlanto-Occipital Instability in Chiari Malformation With Type II Basilar Invagination: A Systematic Morphological Study. Neurosurgery. 2022 Dec 16. doi: 10.1227/neu.0000000000002284. Epub ahead of print. PMID: 36700733.

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