Atlanto-occipital assimilation

Atlanto-occipital assimilation (also called occipitalization of the atlas) is a congenital anomaly in which the atlas (the first cervical vertebra, C1) is partially or completely fused to the occiput (the base of the skull). This fusion reduces or eliminates the normal movement at the atlanto-occipital joint, leading to restricted motion in the neck and potential neurological complications due to compression of the spinal cord or brainstem.

Key Features of Atlanto-occipital Assimilation:

1. **Anatomy**:

    1. The atlas normally articulates with the occiput at the atlanto-occipital joint, allowing for nodding movements of the head.
    2. In atlanto-occipital assimilation, this joint is either partially or completely fused, which alters the biomechanics of the cervical spine and restricts head movement.

2. **Symptoms**:

    1. **Neck stiffness or pain**: Reduced range of motion in the neck, particularly difficulty in flexion and extension movements.
    2. **Headaches**: Due to abnormal pressure on surrounding structures.
    3. **Neurological symptoms**: If the fusion compresses the brainstem or upper cervical spinal cord, it can lead to symptoms like dizziness, weakness, numbness, balance issues, or even severe neurological deficits such as quadriparesis (weakness of all four limbs).
    4. **Visual disturbances**: Rare, but possible if the compression affects certain neural pathways.

3. **Causes**:

1. **Congenital**: It typically occurs due to improper segmentation during embryonic development. It is often found in association with other congenital conditions affecting the spine, such as Klippel-Feil syndrome.

4. **Compensatory Changes**:

1. Since the mobility of the upper cervical spine is restricted, the lower cervical vertebrae (C2 and below) may develop hypermobility or instability to compensate for the loss of movement, which can lead to additional problems such as degenerative changes over time.

5. **Diagnosis**:

1. **X-rays**: Can reveal the fusion of the atlas to the occiput.
2. **CT scan or MRI**: Provide more detailed images, showing the extent of the fusion and whether there is any compression of the spinal cord or brainstem.
3. **Neurological examination**: May be needed to assess any functional impairments.

6. **Treatment**:

1. **Conservative management**: In cases where the fusion does not cause significant symptoms, conservative measures such as physical therapy and monitoring may be sufficient.
2. **Surgical intervention**: Surgery may be required if there is significant spinal cord compression or neurological impairment. This typically involves decompression of the neural structures and stabilization of the cervical spine through fusion techniques.

7. **Prognosis**:

1. Many individuals with atlanto-occipital assimilation are asymptomatic and may only discover the condition incidentally through imaging for another issue. However, if symptoms develop, particularly neurological ones, early diagnosis and treatment are crucial to prevent permanent damage.

Atlanto-occipital assimilation is an important consideration in patients presenting with restricted neck movement and associated neurological signs, as timely intervention can help prevent serious complications.

Assimilation of the atlas is an osseous abnormality which occurs in the region of the foramen magnum. It is demonstrated by the union of the atlas with the occipital bone.

This may be a partial or complete union. Assimilation of the atlas is the most common anomaly found at the craniocervical junction. Other terms describing this abnormality are atlantooccipital fusion and/or occipitalization of the atlas. Of importance, is not that the diagnostician be aware of the varied terms given to this osseous anomaly - but that such anomaly may exist without any typical symptom presentation, and thus, serious consequences of upper cervical spinal manipulative therapy may arise without a complete and adequate clinical assessment.

Occipitalization of the atlas is the most common malformation of the craniovertebral junction. It can be diagnosed on lateral teleradiography and its finding imposes screening for associated atlantoaxial instability. In case of instability, brisk movements of the cervical spine during surgery may result in compression and distortion of the spinal chord and vertebro-basilar vascular system.

Its diagnosis imposes screening for other spinal malformations (spinal fusion, hemivertebra, spina bifida occulta). The major risk is compression and distortion of the spinal chord and vertebro-basilar vascular system, during surgery or anesthesia [1)]

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Kahouadji E, Lucas O, Khonsari RH, Longis J, Hamel O, Corre P. [Occipitalization of the atlas. Radiological diagnosis and clinical significance]. Rev Stomatol Chir Maxillofac Chir Orale. 2013 Jun;114(3):187-91. doi: 10.1016/j.revsto.2013.03.007. Epub 2013 Apr 17. French. PubMed PMID: 23827274.