Complete occipitalization of atlas vertebra with other congenital malformations
- a rare variation

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Abstract

Occipitalization of the atlas vertebra or atlantooccipital fusion represents the most cephalic blocked vertebra found in the vertebral column. It is defined as the congenital bony fusion of the atlas vertebra to the base of the occipital bone of the skull. Out of the sixty skulls studied in the Department of Anatomy, Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar, we come across a dry adult human skull with the total synostosis of the whole atlas vertebra with the occipital bone of the skull. The awareness of this anatomical variation in the patients showing abnormalities of the neck region can help the neurosurgeons, radiologists, anaesthetologists and orthopaedic surgeons to reach at a correct diagnosis.

Key words: basilar part, blocked, synostosis, atlas.

Introduction

Atlas is the first cervical vertebra with one anterior and one posterior arches and two lateral masses. The lateral masses articulate with the occipital condyles to form condyloid type of synovial joint. Complete occipitalization of the atlas vertebra is an important congenital malformation of the craniovertebral region because of the close proximity to the spinomedullary region. It can constrict the spinal canal frequently and can produce a wide range of neurological upsets varying from the transitory headache to the full blown neurological symptoms. The incidence of this synostosis varies from 0.14% to 0.75% of the population. The cause is mainly the failure of segmentation and separation of the most caudal occipital sclerotome and the first cervical sclerotome during the first few weeks of the fetal life. It is frequently associated with the hypoplasia of the basiocciput. This variation may be found incidently during radiological, operative or autopsy findings.

Case report

The present dried adult human skull of unknown sex and age was found in the Department of Anatomy, Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar. Out of sixty skulls studied, the specimen showed the complete fusion of the atlas vertebra with the occipital bone. The lateral masses were completely fused with the occipital condyles. The anterior arch was fused to the basilar part of the occipital bone with a small gap in the anterior midline region. The posterior arch was fused to the squamous part of the occipital bone. There was a gap posteriorly between the posterior arch and the squamous part bilaterally. The gap for the vertebral artery was very small. The transverse process of the left side was almost absent. There was a bony shelf on the right side between the posterior arch and the squamous part of the occipital bone. The zygomatic arch on the left side was convex upwards. There was an unusual foramen in the anterior boundary of external acoustic meatus. These two variants were absent on the right side. (Fig.1).

Discussion

The occipitalization can occur to a varying degrees either partial or complete. In majority of cases, there occur the fusion of the anterior arch and the anterior rim of the foramen magnum and is associated with other skeletal malformations like spina bifida of the atlas vertebra or the fusion of the second and third cervical
vertebra (Klippel-Feil Syndrome). Embryologically the caudal half of the first sclerotome give rise to the lateral masses and anterior and posterior arches of the atlas. If the normal segmentation fails to occur, the atlantooccipital fusion occurs. Two ossification centres appear posterior to each of the lateral mass and the transverse process. The two centres meet in the midline posteriorly at late fourth years of life. A midline defect can be due to failure of fusion of the ossification centres either anteriorly or posteriorly. Fusion between atlas and occiput occurs anteriorly between the arch and rim of the foramen with some segment of the posterior arch of C1 present in some instances. This fragment can frequently constrict the spinal canal causing intermittent symptoms depending on the position of the head.

**Conclusion**

Atlantooccipital fusion is clinically important as it can be a cause for the reduction in the size of the foramen magnum leading to the neurological complications due to the compression of the cord. Also small opening for the vertebral artery to reach the brain can lead to its compressive signs and symptoms.

**References**


**Fig. 1.** Inferior view of skull showing complete occipitalization of atlas vertebra

**Abbreviations**: 
AA—Anterior arch of atlas vertebra; 
P A—Posterior arch of atlas vertebra; 
TP—Transverse process of atlas vertebra.

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