Case report

A Case Report of Atlanto-occipital Assimilation

Shetty AS[1], Jetti R[2], Sirasanagandla SR[2], Nelluri V[2]

Abstract:

Background: Congenital fusion of atlas to the basiocciput is defined as atlanto-occipital assimilation/occipitalization of atlas. ***Case report:*** During the norma basalis demonstration session of skull, we have noticed an assimilation/occipitalization of atlas vertebra. Atlas fusion may be complete or partial; assimilation of atlas is associated with neurovascular and skeletal anomalies. ***Conclusion:*** Atlanto-occipital fusion may reduce the dimensions of foramen magnum thereby leads to brain stem compression causing the consequent neurological complications. Present case may pose difficulty in performing cisternal puncture. This anomaly has high clinical significance as it mimics the Arnold Chiari malformation.

Keywords: Atlas; Occipital bone; Assimilation; Jugular foramen; Septation; Clinical significance

DOI: http://dx.doi.org/10.3329/bjms.v17i1.35301
Bangladesh Journal of Medical Science Vol. 17 No. 01 January'18. Page : 169-171

Introduction:

Atlas or first cervical vertebra; has anterior and posterior arches, a pair of lateral mass and transverse process. The lateral mass presents superior and inferior articular facets. The superior articular facets articulate with the occipital condyles forms the atlanto-occipital joint. The atlanto -occipital junction is the site for several anatomical variations such as assimilation of atlas, bony torticollis, congenital cleft of anterior arch, partial aplasia or hypoplasia of posterior arch, unilateral or bilateral cleft in posterior arch, arcuate foramen and double foramen transversarium. Atlanto-occipital assimilation is one among the reported variations of atlanto-occipital junction[1]. Congenital fusion of atlas to the basiocciput is defined as atlanto-occipital assimilation/fusion or occipitalization of atlas or occipitocervical synostosis. Atlas fusion may be complete or partial; however partial fusion is common and it shows multiple variations based on the parts of atlas involved in fusion[2].

Case Report:

During the norma basalis demonstration session of cranium for medical under graduate students, we have noticed a skull with assimilation/occipitalization of atlas vertebra. The cranium has been identified as adult male; of unknown age. Sex determination of the cranium was carried out according to the description presented in the standard anatomy text books.

We observed that atlas vertebra was completely fused with the occipital bone. Superior articular facets of atlas vertebra were fused with occipital condyles. Anterior and posterior arches were fused with respective margins of foramen magnum. The posterior arch showed a midline defect as a result of failure of fusion of the two halves of posterior arch (Fig: 1). There were additional foramina in the region of groove for vertebral artery above posterior arch due to the complete ossification of posterior atlanto-occipital membrane (Fig: 2). Transverse

1. Ashwini S Shetty, Department of Anatomy, Yenepoya Medical College, Yenepoya University, Mangaluru, Karnataka, India.
2. Raghu Jetti, Department of Basic Medical Science, College of Applied Medical Sciences, King Khalid University Abha Kingdom of Saudi Arabia.
3. Srinivasa Rao Sirasanagandla, Assistant Professor, Department of Anatomy, College of Medicine and Health Sciences, Sultan Qaboos University, Muscat Oman.
4. Venumadhav Nelluri, Department of Anatomy, Melaka Manipal Medical College, Manipal University, Manipal, Karnataka, India.

Correspondence to: Raghu Jetti, Department of Basic Medical Science, College of Applied Medical Sciences, King Khalid University Abha Kingdom of Saudi Arabia. Email: raghujetti@gmail.com

processes were completely fused with the cranium on left side, on right side there were additional formina for the passage of vertebral artery. Foramina transversarium were found to be normal. In addition to the aforementioned observations jugular foramina were completely divided by bony septum in to two compartments (Fig: 1). All other skull bones were well developed and did not show any deformities.

Fig. A: Norma Basalis of skull, Note arrow shows septum in jugular foramen; Star shows midline defect in posterior arch of atlas.

Fig. B: Shows Norma Basalis of skull, Note single arrow shows complete ossification; Double arrow shows additional foramina on right side.

Discussion:

One case reported complete assimilation of atlas involving the whole anterior arch and left half of posterior arch; further posterior arch showed a midline defect. Transverse processes were not fused with occipital bone, present case report is similar to this study except the transverse processes; they were also fused in our case[3]. Complete assimilation of atlas including transverse processes was also reported[4]. Present case shows complete assimilation of atlas including transverse processes as like earlier reports, however this is contrary to the previous reports complete assimilation is associated with midline defect in posterior arch and septation of jugular foramen. The jugular foramen abnormality noted in this case is referred as bridging or septation. Based on the bridging jugular foramen is classified to type I-IV[5]. According to this classification the present case falls under the category of type-I in which there is presence of one septum dividing the jugular foramen in to two compartments.

During normal development, caudal half of fourth occipital somite fuses with cranial half of first cervical sclerotome to form basiocciput. The caudal half of first cervical sclerotome fuses with cranial half of second occipital sclerotome and forms the atlas and odontoid process. Failure of segmentation of first cervical sclerotome results in occipitalization[6].

Atlanto-occipital assimilation causes difficulty in nodding movements of the head; complete assimilation is associated with compensatory movements between atlas and axis which may result in atlanto-axial instability and subluxation[3]. Atlas assimilation may pose difficulty in lateral mass screw fixation for the treatment of atlanto-axial instability. Presence of arcuate foramen may be mistaken for broad posterior arch; the surgeon may insert a screw into it, this may result in stroke or even death by thrombosis, embolism or vertebral artery dissection Assimilation of atlas is associated with neurovascular and skeletal anomalies. It has immense clinical value as it is close to the spinomedullary region with the possibility of neurovascular compression[7]. Usual clinical symptoms associated with occipitalization are short neck, restricted movements of neck, abnormal head position, head ache; neck pain, pain in limbs, dysphagia, dysarthria and torticollis[8]. Occipitalization may compress the vertebral artery leads to vertebro basilar insufficiency, dizziness, seizures, mental deterioration and syncope[6,9].

References:

1. Rajani S. Is Variant Anatomy of Atlas Clinically Important? A Review. *Basic Sciences of Medicine.* 2014;**3**(1):1-7.
2. Rajani SJ, Suttarwala I, Rajani J. An unusual case of unilateral atlanto-occipital assimilation with skull asymmetry. *National journal of medical research.* 2012;**2**(2):238-40.
3. Skrzat J, Mróz I, Jaworek J, Walocha J. A case of occipitalization in the human skull. *Folia Morphol.* 2010;**69**(3):134-7.
4. Hussain Saheb S, Mavishetter G, Thomas S, Prasanna L, Muralidhar P. Occipitalization of Atlas: A case report. *J Biomed Sci Res.* 2010;**2**(2):73-5.
5. Kapakin S, KAPAKIN S. An Unusual Anatomic Variation of the Jugular Foramen with Doubled Posterior Condylar Canal. *Int J Morphol.* 2011;**29(**4):1186-8.
6. Ranade AV, Rai R, Prabhu LV, Kumaran M, Pai MM. Atlas assimilation: a case report. *Neuroanatomy.* 2007;**6**(1):32-3.
7. Young JP, Young PH, Ackermann MJ, Anderson PA, Riew KD. The ponticulus posticus: implications for screw insertion into the first cervical lateral mass. *The Journal of Bone & Joint Surgery.* 2005;**87**(11):2495-8.
8. Jayanthi V, Kulkarni R, Kulkarni R. Atlanto-occipital fusion–report of two cases. *J Anat Soc India.* 2003;**52**(1):71-3.
9. Wysocki J, Bubrowski M, Szymański I. Developmental abnormalities of the craniovertebral region and their significance for heating and balance disorders. *Otolaryngologia*. 2003;**2**:65-71.