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Bony Tubercle on the Anterior Border of Foramen Magnum - A Case Study

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Abstract: ***Presence of tubercles in the foramina of the cranium has aroused the curiosity of anatomists. The foramen magnum is the large opening situated in the occipital bone, and transmits important neurovascular structures. During routine study of skull in the department of Anatomy at DM – Wayanad Institute of Medical Sciences, Meppadi, Kerala, a triangular projection was found at the anterior margin of foramen magnum, with the apex directed backwards towards the posterior margin of foramen magnum. The tubercle measured 1.5mm antero-posteriorly and 2mm transversely.***

Keywords: Cranium, Foramen magnum, Neurovascular, Occipital bone, Tubercles.

1. Introduction

Presence of tubercles in the foramina of the cranium has aroused the curiosity of anatomists. The foramen magnum is the large opening situated in the occipital bone, and transmits important neurovascular structures. Such tubercles are clinically important as it may compress the vital structure that goes to and fro from the brain. It is also important in the field of kinesiology that such structures may retard the movement at the atlanto-occipital joint.

2. Case Report

During routine study of skull in the department of Anatomy at DM – Wayanad Institute of Medical Sciences, Meppadi, Kerala, a triangular projection was found at the anterior margin of foramen magnum, with the apex directed backwards towards the posterior margin of foramen magnum. The tubercle measured 1.5mm antero-posteriorly and 2mm transversely.

Figure 1: Arrow showing a bony tubercle at the anterior margin of the foramen magnum.

3. Discussion

The cartilage centres appear in the base of skull during the second month in three areas 1. Around the cephalic part of the notochord 2. Around the hypophysis cerebrai 3. Between the optic and nasal capsules. The cephalic part of the notochord extends up to the dorsum sellae of sphenoid bone. This part of the notochord is surrounded by the paracordal cartilage which subsequently unites to form basal plate. This is continuous behind with fore precervical or occipital sclerotomes . This fuses with one another to form the basiocciput. The rudimentary transverse processes unite and constitute the ex-occiput, which persists as jugular processes. The lamina of the sclerotome meet behind the foramen magnum and continue further upwards as a supra occiput which develop as squamous part of the occipital bone.

In the mean time the costal elements of the upper 3 or 4 cervical vertebrae are connected to each other in front of the corresponding centrum by bands of mesanchymal condensation which persists as the hypochondral bow. The centrum of atlas is detached from the anterior arch and fuses with centrum of axis, which persists as the odontoid process of the axis, which articulates around the foramen magnum by the means of apical ligament[1].

The occipital bone is perforated by the foramen magnum with the squamous part behind the foramen, the condylar parts lateral and the basilar part in front. A transient mesenchymal hypochondrial bridge of the occipital vertebra along the anterior margin of foramen magnum between the occipital condyles was observed in human embryos of 12.5-21.0mm crown rump length which was completely absent by the 80mm crown rump length. Failure of complete disappearance of the Hypochondrial Bridge during development may manifest as osseous formation in this craniocervical transition region. [2]. The assimilation of various vertebrae into the occipital segments of the skull is responsible for the variable morphology of the craniovertebral region among vertebrates. A partial liberation of one of the vertebral elements which normally

enter into the composition of the basiocciput results in an 'occipital vertebra' [3]. Besides being of anthropological and ethnological interest, these variants may be important in a clinical context. Accessory vertebral elements along the anterior margin of foramen magnum interposed between the basiocciput and atlas may reduce the circumference of the foramen or cause asymmetry. [4,5]. Enlarged median or paramedian bony masses ventral to the foramen may form a pseudojoint with the apical segment of the odontoid process or anterior arch of the atlas, thereby affecting the kinetic anatomy and integrity of the atlantooccipital articulation. [6]. Romanes (1964) commented that the small bony tubercle on the anterior margin of the foramen magnum indicates the position of the apical ligament of the dens. Romanes (1964) and Basmajian (1972) described the presence of a third occipital condyle that projects from the anterior border of the foramen magnum to articulate with the dens of the axis.[7,8]. The basilar process of occipital bone is formed by fusion of the first three primitive vertebrae (or occipitoblasts), the most caudal of which is so-called occipital vertebra or pro-atlas [9]. The failure of distal occipitoblasts to fuse with others gives rise to abnormal bone formations on the external surface of skull around foramen magnum, phenomenon called as “manifestation of occipital vertebra” [9]. Tubercles are formed by exostoses. Albrecht designates – all elements of cranio-vertebral articulation including intraligamentous ossification as “pro-atlas” vertebra. The apical ligament of dens, which forms part of this pro-atlas region, occasionally contains rudiments of notochord within it [10]. An anomaly at the foramen magnum has been attributed to occipitalization of the atlas or assimilation of the atlas to the occipital bone. Assimilation seemed to be bony continuity between the anterior arch of atlas and the anterior lip of the foramen magnum [11].

4. Conclusion

In conclusion it may be stated that one has to be familiar with the anatomical features at the foramen magnum, in order to prevent damage to the neurovasular structures at the formamen magnum. Future scope lies in the field of orthopaedics and neurology as such anomalies may cause compression of the neural structures and also is important in pain management.

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