



UNUSUAL FORAMEN ON THE POSTERIOR ARCH OF ATLAS

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ABSTRACT

Atlas vertebra with a groove for the vertebral artery, dorsal rami of first cervical nerve and venous plexus is present on the superior surface of the posterior arch of the atlas. We found an abnormal foramina on the left posterior arch of the atlas. The vertebral artery is vulnerable to compression in its course between foramen transversarium and the foramen magnum during extreme rotation of the head and neck. This situation may be aggravated by the presence of posterior or lateral bridge of the Atlas and result in compromised blood flow. The presence of the bony ring formed by posterior bridging in the atlas vertebra has been documented in previous literatures. The knowledge of the presence of this additional foramen will be useful for chiropractor, orthopaedic surgeons, radiologist and neurosurgeons during a spinal adjustment and surgical manipulation of the cervical spine.

Keywords: Atlas Vertebra, Foramina, Posterior Arch.

INTRODUCTION

Atlas, the first vertebra has a great influence on the balance of the whole skeleton and is therefore directly responsible for an upright posture. The atlas (C1) bone is a ring shaped bone that supports the globe of the head on top of the spine and, along with the axis bone beneath (C2), allows for a greater range of movement than other vertebrae. Cup-shaped facets on the upper surface of the atlas bone articulate with the occipital bone of the skull and allow nodding and facets beneath articulate with the axis bone (C2) and allow rotation of the head. The atlas bone has bulky masses to the sides which allow it to support the weight of the head and has facets for the attachment of muscles and ligaments. The central space within the ring of the atlas bone is divided into two by a ligament, whereby the front portion receives the process from the axis bone beneath and the posterior portion carries the spinal cord. Structural defects of the atlas vertebra are more common among the cervical vertebra [1], comprising abnormalities includes such as partial or total fusion of atlas vertebra with the occipital bone [2,3]. The split superior articular process, split posterior or anterior arches, and the presence of some accessory bony arches embracing the vertebral artery [1]. Incomplete

ossification of anterior and posterior arches, anterior arch may be absent, posterior arch may have facets and groove for vertebral artery may get converted into a foramen [4]. Bilateral absence of foramen transversarium [5].

CASE REPORT

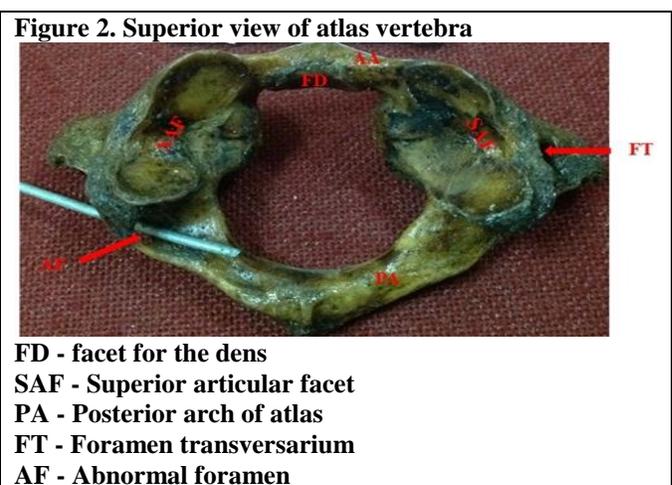
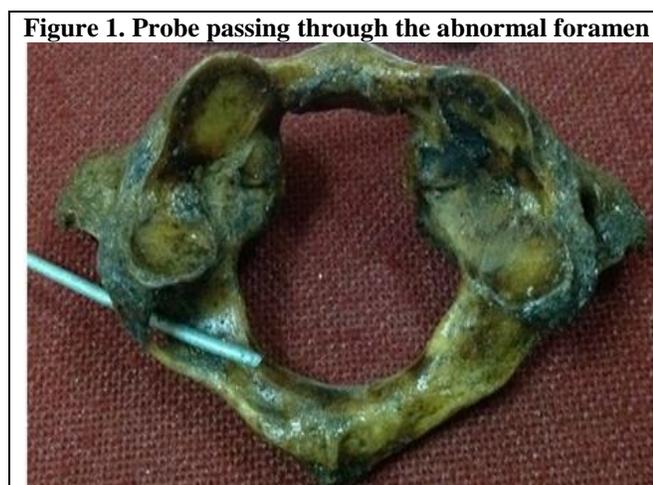
During routine visual inspection of the vertebral collection housed in the Department of Anatomy, we noticed an abnormal foramina on the left posterior arch of the atlas vertebra. The foramina was situated at the lateral part of the posterior arch, behind the lateral mass of the atlas (Figures 1 and 2). Which was almost as large as the foramen transversarium. There were foramina transversaria on both transverse processes and their sizes were normal. No such abnormality was found on the right posterior arch of the atlas. Normal groove for the vertebral artery was identified on both the sides. Other than this there were no other abnormalities found.

DISCUSSION

The ossification of the posterior arch of the atlas commence from the seventh week of intrauterine life, proceeding perichondrally from two centres located in the lateral masses.

The laminae arise from buds in these chondrification centers and extend dorsally, being nearly fused at birth, except for several millimetres of cartilage. Complete fusion of the posterior arch occurs at the age of 3-5 years [6-11]. The 3/5 of the atlas ring is formed by the posterior arch of the atlas. A wide groove immediately behind the lateral mass for vertebral artery, dorsal rami of first cervical nerve and venous plexus is present on the superior surface of the posterior arch of the atlas. The superior border of posterior arch of the atlas gives attachment to posterior atlanto-occipital membrane. This membrane is incomplete at each lateral border to permit way for the vertebral artery and first cervical nerve. The lateral edge of the membrane sometimes ossifies, converting the groove into canal. Thus the neurovascular groove is converted into a bony ring or a bony canal, which is called as “retroarticular canal” or “retro-articular vertebral artery ring” [12].

Atlas bridges, also called ponticles, are bony outgrowths occurring on the atlas vertebra over the third segment of the vertebral artery, converting its groove into a sulcus, incomplete or complete foramen [13]. These bridges may indicate ossification of the posterior atlanto-occipital membrane. The posterior bridge is found dorsal to the lateral mass on the posterior arch of the atlas and when complete, forms the retroarticular canal also called a Kimmerle’s variant or arcuate foramen. [13]. The posterior bridging of the Atlas is considered as a nonmetric trait of the infracranial skeleton [14]. Mechanism of formation of this bony ring is not clearly understood but a number of theories have been proposed : ossification of the connective tissue surrounding the vertebral artery, late ossification of the lower edge of the atlanto occipital membrane [15]. Some authors have suggested that this trait is familial rather than age related [16, 17].



CONCLUSION

The knowledge of presence of abnormal foramen on the posterior arch of atlas will be useful for the, chiropractors, orthopedic surgeons, radiologists, neurosurgeons for the spinal adjustment and also during surgical manipulation of the cervical spine. During extreme rotation of the head and neck, the vertebral artery is more vulnerable for compression and by the presence of this abnormal foramen in which the vertebral artery may pass can lead to compromised blood flow.

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

STATEMENT OF HUMAN AND ANIMAL RIGHTS

All procedures performed in human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors.

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