

Bilateral Posterior and Lateral Ponticles Resulting In the Formation of Vertebral Artery Canal for the Atlas: Case Report

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Abstract: Atlas first cervical vertebra having no spine and body differs from other vertebra. Contains two archs anterior and posterior. Posterior arch contains groove for vertebral artery. During routine osteology classes for undergraduate medical students, we observed presence of bilateral posterior and lateral ponticles which are forming canal for vertebral artery on behind and lateral to lateral mass of atlas. Present case report is very rare anomaly which may lead to stenosis of vertebral artery and may be useful for orthopaedics during surgical manipulation of cervical spine.

Keywords: Arcuate foramina, atlas vertebra, ponticuli, posterior arch.

I. Introduction

First cervical vertebra called as atlas, which support the globe of the head. The name of the atlas derived from a deity of Greek mythology called atlas. It is ring shaped having two arch anterior and posterior. Atlas differs from other vertebra without body and spine. Contains weight bearing two lateral mass with articular facets. Posterior arch forms 3/5th of circumference of atlantal ring, having groove called as sulcus arteriae vertebralis which transmits vertebral artery and first cervical nerve. Rarely this groove may be converted into foramen by complete posterior ponticles connecting the superior articular facet to posterior arch. This foramina called by different names as saggitale foramen and atlantal posterior foramen, arcuate foramen, a variant of Kimmerle's anomaly, canalis vertebralis, retroarticular vertebral artery ring, arcuate foramen, retroarticular canal, and retrocondilar vertebral artery ring, ponticulus posticus. Some times very rarely can see lateral ponticles. These spicule extend from the superior edge of the lateral mass of atlas to posterior root of the transverse process. Presences of bilateral posterior and lateral ponticles are very rare. In this case we are reporting presence of both ponticles bilaterally resulting canal for vertebral artery.

II. Case Report

During osteology demonstration classes for undergraduate medical students, we observed that presence of bilateral posterior ponticles projecting from the posterior edge of lateral mass to join the posterior margin of groove of vertebral artery of atlas forming the arcuate foramen bilaterally [fig.1]. We also noticed projecting bilateral lateral ponticle from the lateral edge of lateral mass and from the root of transverse process but both spicule failed to fuse forming incomplete lateral foramen. Thus both these ponticles forming canal behind and lateral to the lateral mass for vertebral artery bilaterally [fig 2].

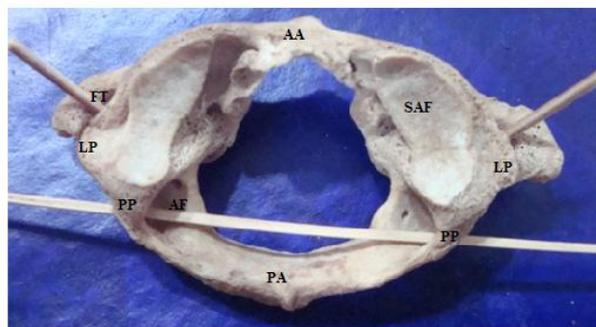


Figure 1: showing arcuate foramen bilaterally [AF] and lateral ponticles [LP] both the sides, posterior ponticles [PP], superior articular facet [SAF], posterior arch [PA], anterior arch [AA], foramina transversaria [FT].



Figure 2; showing incomplete vertebral artery canal [red arrow mark], lateral ponticles [LP], posterior ponticles [PP].

III. Discussion

In this case we observed a very rare anomaly presence of bilateral canal for vertebral artery. Tubbs et al., noticed presence of unilateral vertebral canal¹. Rekha et al., noticed out of 200 macerated atlas, posterior ponticuli in 62(31%), lateral in 13(6.5%) and posterolateral in 5(2.5), complete ponticuli in 9(4.5%), incomplete in 69(34.5%) and bilateral 34(17%), unilateral in 46(28%), right sided in 24(12%) and left sided in 22(11%). Incidences of posterior incomplete unilateral ponticuli were higher in their study and posterior complete ponticuli were more compared to lateral². Radiographic study reveals about presence of ponticulus posticus bilateral complete in 34.5%, bilateral incomplete in 11.6%, one complete and one incomplete 09.5%, unilateral complete in 24.8%, unilateral incomplete in 19.6% and complaints which exhibits in ponticulus posticus ,backpain(dorsal ,lumbar,sacral)in 36%,headache,vertigo,diplopia in 2.9%, neck, brachial symptoms in 23.7%, hip,leg pain 08.2%,tension,hypeactivity,insomnia ,high blood pressure in 04.3%,respiratory illness in 01.7%³. Cushing K E⁴ and Taitz et al.,⁵concluded , the lateral and posterior ponticles may be remnants of proatlas, the so called occipital vertebra. Mitchell⁶ and Romanus et al.,⁷ suggested that they represent ossified primitive ligaments or parts of the posterior atlanto-occipital ligaments. The lateral ponticuli may represent the rudimentary transverse process of the proatlas⁸. Taitz and Nathan⁵ stated that the foramen arcuale might be considered as accessory transverse foramen. Origin of the bony bridge is an issue, previous studies have suggested it may be a product of congenital development(Allen⁹,1879;Cleland¹⁰,1960;VonTorklus et al.,¹¹1975),a genetic trait(Selby et al.,¹²) ,an ossification due to age (Pyo&Lowman¹³,1959;Breathnach¹⁴,1965;White &Panjabi¹⁵,1978),or the result of external mechanical factors(Taitz &Nathan⁵,1986). Foramen arcuale is associated with Barre-Lieou syndrome, which represents symptoms of headache, retro-orbital pain, vasomotor disturbance of the face and recurrent disturbances of vision, swallowing and phonation due to alteration of blood flow within the vertebral arteries and an associated disturbance of periarterial disturbance of periarterial nerve plexus. More than 50% of head rotation occurs at the atlantoaxial joint, the vertebral artery is most vulnerable to compression and stretching at this level; thus additional compression /tethering of this vessel by a foramen arcuale may compound its predisposition to injury¹⁶.

IV. Conclusion

Vertebral artery is vulnerable to compression during extreme rotations of the head and neck. This situation may be aggravated by the presence of this canal for vertebral artery resulting in stenosis and compromised blood flow. It can also taken count by the orthopaedic surgeons during a surgical manipulation of the cervical spine. This report may also be useful for neurosurgeons, radiologists, anthropologists.

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