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Case Report

Median deficiency in the posterior arch of the atlas vertebra: a case report

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ABSTRACT

Isolated cases of partial agenesis of atlas were initially considered benign variations, without any clinical or pathological significance. However, there is increasing evidence that neurological symptoms may occur even after minor cervical trauma in subjects with defects in the posterior arch of the atlas. The present case study describes a rare case of median deficiency in the posterior arch of atlas vertebra. The knowledge of this benign variation is crucial as it may aid clinicians in correct management of subjects presenting with resolution of symptoms and avoid excessive investigations.
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Key words [atlas] [median deficiency] [posterior arch] [congenital absence]

Introduction

It seems to be a principle in morphology that the greater the amount of specialization of function manifested by any organ, the farther does the structure so specialized depart from the form of the primordial type to which it belongs. This principle is particularly exemplified in the case of the two upper cervical vertebrae, the atlas and the axis, as, on account of the special varieties of motion in this region, the different parts are so modified that it is in some instances difficult to assign to the processes of these bones their exact positions as serial homologues of the processes in other vertebral segments [1]. Variations in this specialized region may present clinical features varying from mild neck pain, headache, vertigo, buzzing ears to neurological symptoms depending on the degree of variation. The clefts and aplasia of the atlas are rare variations [2-5] and may be mistaken for fractures in patients who have sustained cervical spine injuries [6]. Hence recognition of this benign variation is important for the correct management of such cases. The present case study describes a rare case of median deficiency in the posterior arch of the atlas vertebra and discusses its clinical significance.

Case Report

During routine osteology discussion class for the undergraduate students in the Department of Anatomy, Government Medical College, Amritsar, median deficiency in the posterior arch of one of the thirty atlas vertebrae was observed. The right limb of the arch showed a bulbous ending, while the left limb of the arch had a flattened appearance. (Figure 1).

Discussion

The region of the upper cervical spine due to its complicated embryonic development has been reported to be highly vulnerable to skeletal and neural developmental variants [7]. Atlas develops from three centers of ossification: one for the anterior tubercle and two for the lateral masses [8]. The ossification of the posterior arch begins during the 7th week of the intrauterine life and proceeds perichondrically from the two centers located in the lateral masses. A separate ossification center develops in the posterior cartilaginous cleft during the second year of life. Complete ossification of the posterior arch occurs between 3–5 years of age. Defects in the posterior arch have been attributed to absence or defective development of cartilaginous preformation rather than disturbances of the ossification of the arch [2,9]. Posterior arch deficiencies may range from moderate defects (median, uni– and bilateral clefts) to complete lack of ossification [5]. Currarino et al. have classified the congenital anomalies of the posterior arch of the atlas into five types: type A – failure of posterior midline fusion with

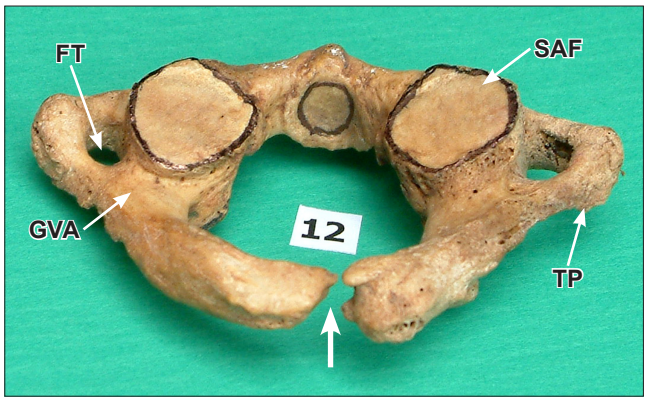

Figure 1. Photograph shows the superior aspect of the atlas vertebra with median deficiency in the posterior arch. *(**FT**: foramen transversarium; **SAF**: superior articular facet; **GVA**: groove for vertebral artery; **TP**: transverse process; **arrow**: median deficiency in the posterior arch)*

a small gap remaining; type B – unilateral cleft; type C – bilateral cleft with preservation of the most dorsal part of the arch; type D – complete absence of the posterior arch with a persistent isolated tubercle; type E – complete absence of the entire posterior arch [3]. The present case befits into type A, of their classification. Kwon and coworkers cited the study of Geipel, who reported clefts of the posterior arch in 4% of 1613 autopsy specimens studied, 97% being median clefts [10]. Wysocki observed median split posterior arch in 3 female atlas out of 100 vertebrae studied [11]. Thereby, suggesting a higher incidence in females as compared to the males. Several disorders including Arnold-Chiari malformations, gonadal dysgenesis and the Klippel-Feil, Down and Turner syndromes have been associated with the congenital absence and hyperplasia of the posterior arch of the atlas [1,2]. Wysocki quoted the work of Li, who reported different variants and developmental defects of the atlas to occur together, especially in families by hereditary transmission [11]. In most reports, deficits in the posterior arch have been discovered incidentally in asymptomatic subjects following x-ray examination of cervical spine due to mild injury [2,5,6]. However, no reports documenting association between permanent neurological deficits and occurrence of posterior arch defects have been reported. Cervical spine radiography with flexion/extension views may help to detect cases with mechanical instability where there is increased risk of spinal cord injury [12]. Awareness of this variation is of significant importance to orthopedists, as its co-existence with fractures may result in instability in the cervico-occipital region and non-union thereby leading to difficulty in further management. The recognition of this variant, early in life may prevent serious neurological deficits in subjects having any defects in the posterior arch, by restricting their neck movements and activities like strenuous sports.

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