Posterior arch defect in a dry atlas

Juan A. Sanchis-Gimeno · Luis Aparicio

Received: 17 January 2011 / Accepted: 6 February 2011 / Published online: 17 February 2011
© Springer-Verlag 2011

The human atlas can be divided anatomically into three parts: the anterior arch, the lateral masses, and the posterior arch.

Ossification centers for the two lateral masses appear at about the seventh week of gestation, proceeding perichondrally from two centers located in the lateral masses [1–3]. The laminae arise from buds in these growth centers and extend dorsally, becoming nearly fused by birth except for several millimeters of cartilage [2, 3]. A separate ossification center develops in the cartilaginous cleft during the second year, and the posterior arch is completely ossified around the fourth year [1].

Although anomalies of the posterior arch of the atlas are very rare, Currarino et al. [4] proposed a classification of posterior arch defects in five types (A–E) depending on the extent of absence of the posterior arch and the presence or the absence of the posterior tubercle: Type A, failure of midline fusion of the two hemiarches with a small gap remaining; Type B, unilateral cleft ranging from a small defect to the complete absence of one hemiarch; Type C, bilateral clefts of the lateral aspects with preservation of the most dorsal part of the arch; Type D, absence of the posterior arch with a persistent posterior tubercle, and; Type E, absence of the entire arch including the tubercle.

Congenital anomalies of the posterior arch of the atlas are almost always asymptomatic and found incidentally in imaging studies. Nevertheless, the visual examination of human skeletons provides us with a unique opportunity to discover and describe posterior atlas arch defects.

Following on from this, we analyzed the presence of posterior arch defects in 136 dry cadaveric cervical columns. All cadavers were between 61 and 86 years of age. Ethical approval from the ethics committee of our institution was obtained.

We found one atlas (0.73%) with a posterior Type A arch defect in the sample of 136 dry cadaveric columns (Fig. 1). The other atlases had no posterior arch defects.

Posterior midline fusion defects with a remaining small gap represent the commonest type A. They are thought to be due to a failure of the normal posterior arch chondrification process and are usually found incidentally [2]. However, a subgroup of patients with posterior arch defects of the atlas are predisposed to a variety of neurologic symptoms/deficits, including transient quadriparesis following minor cervical or head trauma [2].

Although congenital posterior arch defects of the atlas are unusual, they have been associated with several

Fig. 1 Image showing the failure of posterior midline fusion of the atlas with a small gap remaining (Type A defect)

J. A. Sanchis-Gimeno (✉) · L. Aparicio
Department of Anatomy and Human Embryology,
Faculty of Medicine, University of Valencia,
Av Blasco Ibanez, 15, 46010 Valencia, Spain
e-mail: juan.sanchis@uv.es

diseases, such as in skeletal dysplasias, Goldenhar syndrome, Conradi syndrome, Down's syndrome and familial incidence [5].

In conclusion, we have presented an unusual finding which is a posterior arch defect of the atlas. Nevertheless, more studies are necessary to ascertain the prevalence of these defects and to determine familial incidence.

Conflict of interest None.

References

1. Hosalkar HS, Gerardi JA, Shaw BA (2001) Combined asymptomatic congenital anterior and posterior deficiency of the atlas. *Pediatr Radiol* 31:810–813
2. Klimo P Jr, Blumenthal DT, Couldwell WT (2003) Congenital partial aplasia of the posterior arch of the atlas causing myelopathy: case report and review of the literature. *Spine* 28:E224–E228
3. Corominas L, Masrouha KZ (2010) Congenital absence of the posterior arch of the atlas associated with a fracture of the anterior arch. *J Bone Joint Surg Br* 92:1300–1302
4. Currarino G, Rollins N, Diehl JT (1994) Congenital defects of the posterior arch of the atlas: a report of seven cases including an affected mother and son [Review]. *Am J Neuroradiol* 15:249–254
5. Al Kaissi A, Ben Chehida F, Gharbi H, Ben Ghachem M, Grill F, Varga F, Klaushofer K (2007) Persistent torticollis, facial asymmetry, grooved tongue, and dolicho-odontoid process in connection with atlas malformation complex in three family subjects. *Eur Spine J* 16(Suppl 3):265–270