Morphology of the Paracondylar Process in a Dry Adult Human Skull: A Case Report

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Abstract: The paracondylar process is a rare osseous process arising at the cervicooccipital region and belongs to a large and heterogenic group of developmental abnormalities of the craniovertebral junction. Two stout cylindrical bony paracondylar processes (PCP) were found arising from the jugular process of the occipital bone in an adult male human dry skull. They projected downwards and medially; they were located postero-lateral to the occipital condyles and medial to the mastoid processes. The PCP were extending caudally towards the transverse process of the atlas; and were located just lateral to the posterior arch of atlas. Awareness of this paracondylar process, its topographical relations and its attendant problems is of importance to clinicians, radiologists, surgeons and chiropractors.

Keywords: Paracondylar process; Occipital bones abnormalities; Exostoses; Cervical vertebrae abnormalities

I. Introduction

The craniovertebral region is said to be an area of the spine with a high level of variability; there are several types of craniovertebral fusion. We present one of those, the paracondylar processes (PCP). A PCP is described an enlarged bony process of the cranial base which projects caudally toward the transverse process (TVP) of the atlas. It is considered as an incidental finding on radiographic examination. In extreme cases it is said that the PCP can fuse to the TVP of the atlas causing functional limitations in neck movement and may cause clinical symptoms due to alterations in posture and restricted range of motion.

The PCP is a rare osseous process arising at the cervicooccipital region that belongs to a large and heterogenic group of developmental abnormalities of the craniovertebral junction. Although this entity is usually asymptomatic, it is rarely associated with symptoms such as headache and limited range of motion. It can often alarm the young patient or their parents, pose a diagnostic problem for clinicians and even hinder performance of special surgical operations in the area. Thus correct identification of this variant is essential [1].

II. Case report

The left and right stout cylindrical bony paracondylar processes (PCP) were found arising from the respective jugular processes of the occipital bone in an adult male human dry skull. They projected downwards and medially with a slight concavity on their medial side; they were located postero-lateral to the occipital condyles and medial to the mastoid processes (Fig. 1-5). Superiorly, the PCP had slightly broadened base merged with the jugular processes while a constriction was seen forming a “waist” 5 mm below; inferiorly they ended as rounded to oval tips (Fig. 1-5). The right PCP was 8.01 mm and left PCP 9.16 mm long; their diameter at the base was 6.68 mm and 7.97 mm and the diameter at the tip 3.90 mm and 5.50 mm respectively. The PCP was extending caudally towards the transverse process of the atlas; and they were located just lateral to the posterior arch of atlas. Transverse foramen of the atlas was almost very close on the right sided PCP. No articulation or fusion was found between the above structures; no facets were found on the PCP. This abnormality was consistent with a paracondylar process, a very rare normal variant of the craniovertebral junction.

III. Discussion

The paracondylar process is a broad-based cone shaped bony mass arising medially to the mastoid process that projects down from the posterolateral aspect of the occipital condyle toward the transverse process of the atlas [2]. The paracondylar process belongs to a heterogenic group of congenital anomalies of the craniovertebral junction. This group of osseous abnormalities covers a broad spectrum from minor anatomic variations to major true malformations, as a result of developmental errors of the craniovertebral region [3].

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The paracondylar process represents vestiges of the cranial base 1st cervical somite. It arises as a result of the separation of the dermal and mesenchymal layers through the process of somitization, which occurs around the 4th week of development in utero [11]. The occipital bone is derived from basioccipital, exoccipital, and supraoccipital portions which all surround the foramen magnum [12]. The basiocciput goes on to develop into four occipital somites. The caudal portion of the 4th occipital somite goes on to fuse with the cranial portion of the 1st cervical somite to form the proatlas. The proatlas is assimilated into the occiput to form the articular condyles and the tip of the odontoid process. The caudal half of the 1st cervical somite and the cranial part of the second cervical somite go on to form the atlas and the odontoid process of the axis [11]. A paracondylar process represents vestiges of the cranial half of the first cervical sclerotome [2].

Embryology

The paracondylar process would have formed from a maldevelopment of the first cervical sclerotome around the 4th week of development in utero [11]. The occipital bone is derived from basioccipital, exoccipital, and supraoccipital portions which all surround the foramen magnum [12]. The basiocciput goes on to develop into four occipital somites. The caudal portion of the 4th occipital somite goes on to fuse with the cranial portion of the 1st cervical somite to form the proatlas. The proatlas is assimilated into the occiput to form the articular condyles and the tip of the odontoid process. The caudal half of the 1st cervical somite and the cranial part of the second cervical somite go on to form the atlas and the odontoid process of the axis [11]. A paracondylar process represents vestiges of the cranial half of the first cervical sclerotome [2].
IV. Conclusion

A large PCP may articulate or fuse with the lateral transverse process of atlas producing symptoms. It is generally detected on radiographic examination of the neck. However, when small it may be of no clinical significance and even be overlooked on radiological imaging. Thus, awareness of this process, its topographical relations and its attendant problems is of importance to clinicians, radiologists, surgeons and chiropractors.


Fig 1 Showing left and right PCP and the asymmetric foramen magnum
Fig 2 Showing left and right PCP

Fig 3 Showing right PCP with its relation to Atlas
Fig 4 Showing left PCP with its relation to Atlas transverse process and transverse foramen

Fig 5 Showing right and left PCP and the asymmetric foramen magnum