

# Congenital Malformations of Vertebral Articular Processes in Dogs



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## KEYWORDS

- Congenital • Malformation • Articular process • Articular facet
- Articular process dysplasia • Caudal articular process aplasia
- Caudal articular process hypoplasia • Pug

## KEY POINTS

- Congenital anomalies of the articular processes in dogs are not necessarily incidental.
- The introduction and widespread use of advanced cross-sectional imaging such as computed tomography and MRI in academic as well as private veterinary practice have allowed for detailed evaluation of the spine, spinal cord, and nerve roots.
- The clinical relevance and clinical manifestation of articular processes anomalies are heavily dependent on location within the spine.
- Although no definitive cause has been identified, the breed-specific anomalies of articular processes that have thus far been identified are strong indicators of a genetic component.

## ANATOMY AND PHYSIOLOGY REVIEW

The spine is divided into 5 regions: cervical, thoracic, lumbar, sacrum, and caudal/coccygeal. The standard formula for the spine of the domestic dog is C7, T13, L7, and S3. There are a variable number of caudal vertebra. All vertebral bodies have the same basic components: body, arch, and paired articular processes (**Fig. 1**). The arch is composed of paired pedicles and laminae. Articular processes are located at the cranial and caudal surfaces of the vertebra and arise from the junction of the pedicle and lamina<sup>1</sup> (**Fig. 2**).

The vertebral canal is formed by fusion of the vertebral body and arch; the canal protects the spinal cord and spinal nerve roots. As a whole, the vertebral column supports the head and provides attachment of major muscle groups. With the exception of the fused sacrum, all vertebrae are separate from one another and articulate with adjacent

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The author has nothing to disclose.

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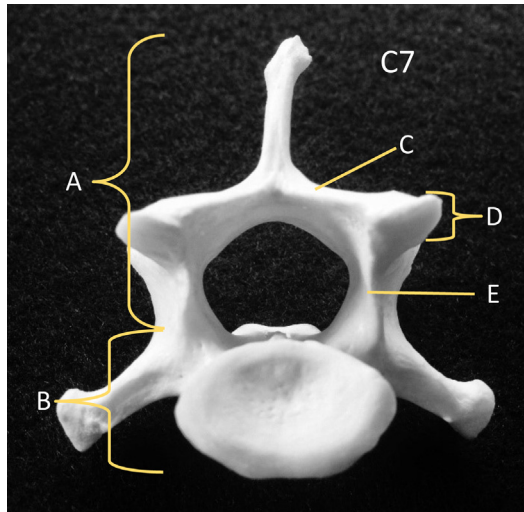
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**Fig. 1.** Caudal view of the seventh cervical vertebra. All vertebral bodies have the same basic components: (A) arch, (B) body, (C) lamina, (D) paired articular processes, (E) pedicle. (Please note that only the caudal articular processes are labeled in this image [D]. The cranial articular processes are not visible due to superimposition.)

vertebral bodies via synovial joints to form movable joints.<sup>1,2</sup> In conjunction with soft tissue structures of the spine, the articular process joint functions to provide stable flexibility between the vertebral bodies.<sup>1-5</sup> The articular processes contribute up to 30% of the stability of the vertebral column.<sup>6,7</sup> The articular processes in the cranial thoracic spine (T1-T9) also function in weight-bearing.<sup>3</sup>

Motion of the spine is governed by orientation of the corresponding caudal and cranial articular processes. Although as a whole, the vertebral column of the dog is flexible, the range of motion for individual articular process joints is limited by comparison.<sup>1,2</sup> The basic movements of the vertebral column include dorsal arching; extension; ventral arching; lateral flexion; and rotation.<sup>1</sup> With the exception of C1 and C2, the cranial and caudal articular processes of the entire vertebral column have orientation that may be classified into 1 of 2 categories. Cranial processes will be either craniodorsal or medial; caudal processes are caudoventral or lateral<sup>1</sup> (Fig. 3).

In locations of the vertebral column where stability is imperative, mobility of the adjacent vertebral bodies is limited by opposing incline of articulating caudal and cranial processes. Examples include the atlanto-axial articulation, cervical-thoracic (CT) junction, and the anticlinal space<sup>1</sup> (Fig. 4). The most flexible locations of the spine have the most voluminous articular capsules to allow for the greatest range of motion. These locations include the base of the tail and the cervical region (Fig. 5A).<sup>2</sup>

### ***The Cervical Vertebrae***

There is little variation of the anatomy of the articular processes of C3-C7. The caudal articular processes have caudoventral orientation, and cranial articular processes are oriented in corresponding craniodorsal direction<sup>1</sup> (see Figs. 2 and 3). Cervical articular process joint capsules are voluminous, allowing for large range of motion.<sup>2</sup>

In addition to the readily identifiable unique shapes of C1 and C2, their articulation is also different. Congenital anomalies of the atlanto-axial and atlanto-occipital articulations are covered in a separate article.

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