

# Imaging features of occipito-atlanto-axial joint malformation in a young dog

A 6-month-old, male entire cocker spaniel presented with a one week history of progressive abnormal gait. Intermittent compulsive circling to the right was reported since being in the owners' possession. Neurological examination findings included occasional compulsive behaviour, intermittent right circling, ambulatory tetraparesis with proprioceptive ataxia in all four limbs and scuffing with thoracic limbs. Hopping was reduced in all four limbs with intact paw positioning. The remainder of the neurological examination was normal. Neuroanatomic localization was to the right forebrain and C1-C5 spinal cord segments. Haematology and serum biochemistry were unremarkable. Enzyme-linked immunosorbent assay for vector-borne diseases (*Anaplasma* spp, *Borrelia burgdorferi*, *Ehrlichia* spp, *Dirofilaria immitis*) was negative. Imaging of the head and cervical region identified multiple malformations at the occipito-atlantoaxial junction. These abnormalities included absent dorsal arch of C1, absent normal atlanto-occipital joints, partial fusion of C1 to the skull base (Fig 1A) and hypoplastic spinous process of C2 with incomplete midline fusion (Fig 1D). Three rounded osseous fragments were identified between the C1/2 articulation and suspected to represent remnants of the dorsal arch of C1. Abnormal cranial positioning of the spinous process and arch of C2 was identified (Fig 1B-D). Secondary dorsal positioning of the dens resulted in dorsoventral narrowing of the vertebral canal and marked dorsal

kinking of the cervical spinal cord (Fig S1). A subtle T2W and STIR intramedullary hyperintensity was identified dorsal to the dens at C2 (Fig S1A-C). No intracranial abnormalities were identified to explain the intermittent circling to the right. Congenital occipito-atlanto-axial malformation resulting in instability and subluxation of the atlantoaxial junction and secondary spinal cord compression accounted for the patient's clinical presentation. Further options into surgical stabilisation or conservative management, with exercise restriction were offered. Owners elected the latter. At 2-month follow-up, the dog slightly worsened, however, remained ambulatory tetraparetic.

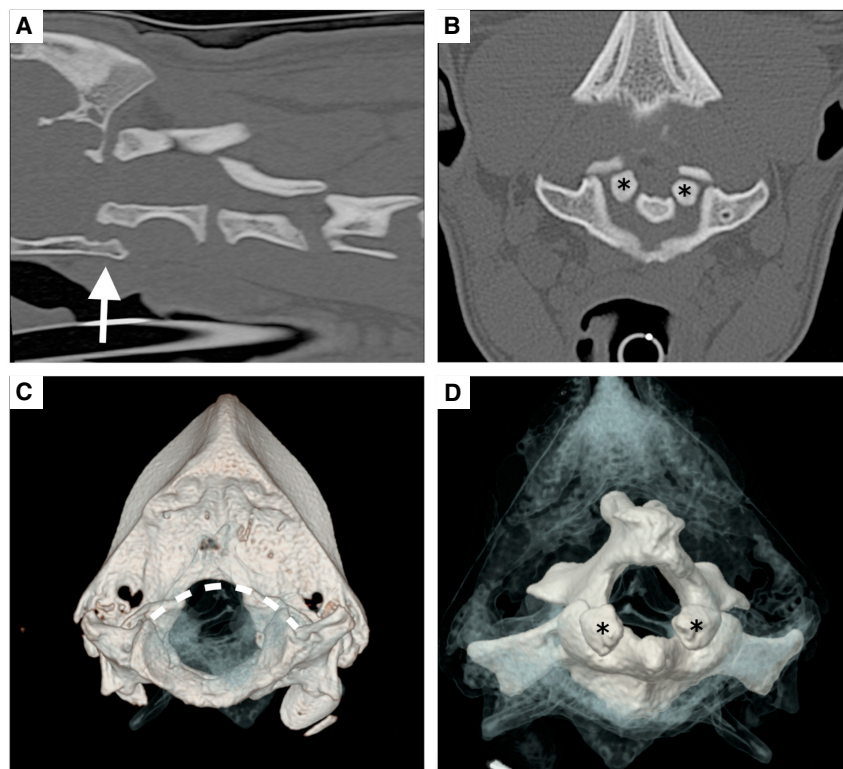
## Supporting Information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

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**FIG 1.** Multiplanar and 3D volume reconstructions of the occipito-atlanto-axial joint malformation; (A) fusion of the occipital bone and ventral arch of the atlas (white arrow), (B-D) absent dorsal arch of the atlas (dashed line) with suspected dorsal arch remnants in situ (asterisks). Hypoplastic spinous process of C2 with incomplete midline fusion (D)