

The second cervical vertebra (C2/axis) is atypical and is the strongest of the cervical vertebrae. The axis enables rotation of the head and C1 (atlas) about the superiorly projecting dens (odontoid process).

The **dens (Syn. odontoid process)** is a conical projection that arises from the superior surface of the body of C2. It may be tilted posteriorly, anteriorly or laterally with respect to the vertebral body. The posterior surface of the dens has a broad groove for the strong **transverse band of the cruciform ligament** (Syn. transverse ligament of the atlas), which holds the dens against the anterior arch of C1. The anterior surface has an ovoid facet for articulation with the facet on the posterior aspect of the anterior arch of C1. The apical ligament attaches to the pointed apex of the dens and the alar ligaments attach to ovoid flattenings on the postero-lateral aspect of the apex.

Superiorly at the junctions of the vertebral body of the dens and the vertebral arch are superior articular processes bearing large, ovoid and flat or slightly convex superior articular facets, which articulate with the inferior articular facets of C1. They face supero-laterally and permit forward gliding of one lateral mass and backward gliding of the other lateral mass during rotation of C1 on C2. At the junction of the pedicles and the lamina are inferior articular processes with concave inferior articular facets that face antero-inferiorly.

The anterior surface of the vertebral body has a downward projecting lip to which the anterior longitudinal ligament attaches. The lower posterior surface of the body gives attachment to the posterior longitudinal ligament and tectorial membrane.

The postero-laterally projecting pedicles are deeply notched inferiorly. The small and rounded transverse processes project infero-laterally from the pediculo-laminar junctions. The foramina transversaria are directed supero-laterally as the **vertebral artery** passes laterally under the superior articular facet. The postero-medially projecting laminae are thick. The large bifid spinous process is concave inferiorly with the ligamentum nuchae attached to the apical notch; it is easily palpable and is the first prominent bony landmark below the base of the occiput.

The superior and inferior articular processes from C2 (inferior articular process) to C7 form the articular pillar of the cervical spine. It is palpable lateral to the cervical spinous processes.

Atlanto-Axial Joint

The lateral masses support the articular facets for the **atlanto-axial (C1/C2) joint**. The combination of the position and shape of these joints, as well as the atlanto-odontal articulation gives the C1/C2 joint a large range of motion, particularly in rotation. The C2 facet positions demonstrate its functional nature, with the superior facets being anterior to articulate with C1, whilst the inferior facets are relatively posterior, in line with the typical vertebrae below.

Ossification

Two primary ossification centers appear in the vertebral arch (7th or 8th week in-utero) and one in the centrum (4th or 5th month in-utero). The arches unite during the first year and join with the body by the third year. Bilateral primary ossification centers appear in the dens during the sixth month in-utero and unite prior to birth. A single secondary ossification center appears in the apex of the dens between the fifth and eighth years and unites with the rest of the dens by the twelfth year. A cartilaginous disc separates the dens from the body, the periphery of which ossifies while the center may remain cartilaginous into old age. An epiphyseal plate is formed inferior to the vertebral body at puberty and fuses with the remainder of the body by 25 years of age.