

The role of CT imaging in the congenital absence of a cervical spine pedicle: a case report and review of the literature

Bjoern Kitzing^{1*}, Yu Xuan Kitzing²

1. Department of PET and Nuclear Medicine, Royal Prince Alfred Hospital, Sydney, Australia

2. Department of Radiology, Royal Prince Alfred Hospital, Sydney, Australia

* **Correspondence:** Bjoern Kitzing, MBBS, MD, Department of PET and Nuclear Medicine, Royal Prince Alfred Hospital, Missenden Road, Sydney, New South Wales, Australia (✉ bkitzing@gmail.com)

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ABSTRACT

The congenital absence of a cervical spine pedicle is a rare clinical condition which is usually picked up as an incidental finding on imaging studies performed on patients complaining of neck pain following trauma. It is important to recognize that the finding is not traumatic in origin as this has implications regarding the treatment. We report a case of congenital absence of a cervical spine pedicle and present a review of the literature.

CASE REPORT

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A 35-year-old man presented with right sided neck and left hand pain after falling off his bicycle on account of a car clipping his back wheel. The patient wasn't wearing a helmet and admitted to having consumed 6 beers before commencing his journey. He had no motor or sensory deficits and no previous history of posterior neck pain. On examination there was midline tenderness over C6 with localized, non-radiating, right-sided muscular pain lateral to this. Neck movements weren't painful. Plain films of the left hand revealed normal alignment without any fractures and the pain there was considered to be due to local soft tissue injury. Cervical spine X-ray showed abnormal alignment of the spine with discordant rotation demonstrated above and below C6, best seen on the anteroposterior view. No definite fracture was seen (Figures 1 and 2). As the clinical finding of C6 tenderness correlated with the imaging abnormality, the patient proceeded to computed tomography of the cervical spine. The CT scan confirmed a discordant rotation at C5/6. There was absence of the right C6 pedicle with dorsal displacement of the right C6 articular

pillar. The right transverse process was incomplete with dorsal defect to the foramen transversarium. There was pseudoarthrosis between the corresponding C5 inferior articular process and the anterosuperior aspect of the right C6 articular pillar. The absence of a pedicle division between the right C5/6 and C6/7 neural exit foramina resulted in the formation of a combined enlarged neural exit foramen best appreciated on 3D reformat. There were also associated degenerative changes with contralateral C6/7 neural exit foraminal stenosis. (Figures 3 and 4). As the changes observed on CT were of long standing appearance without soft tissue swelling or acute fracture, no further imaging was obtained. The patient was treated conservatively and discharged for follow-up with his local general practitioner.

DISCUSSION

The congenital absence of a cervical spine pedicle was first described by Hadley in 1946 (1). As an unusual congenital anomaly it can be associated with other osseous

anomalies and potentially confusing radiologic manifestations which is often the case in acute trauma (2-5). It is therefore important to be able to distinguish the absence of a cervical spine pedicle from other clinical entities that require different diagnostic and therapeutic procedures. A review of the literature reveals that about 70 cases of this congenital anomaly have so far been reported (6-15). Plain radiography can in many instances make the diagnosis, but other imaging studies, foremost three-dimensional computed tomography (CT), should be performed in order to accurately evaluate the radiological findings.

The most commonly described congenital absence of a cervical spine pedicle is that of C6 (39%). This seems to occur almost always unilaterally (2,5,11).

The most common presenting symptom of this anomaly is neck pain but more often it is incidentally found, especially in the context of recent trauma (3). Plain film radiography is usually the first step in evaluating these patients but then frequently progresses to computed tomography, magnetic resonance imaging and in some cases myelography. Wiener et al. (5) describe several characteristic radiographic features of this congenital anomaly namely: 1) the false appearance of an enlarged ipsilateral neural foramen due to the absent pedicle; 2) a dysplastic, dorsally displaced ipsilateral articular pillar and lamina; and 3) a dysplastic ipsilateral transverse process. Our reported case demonstrates all three classical features. In our patient, the consequent disturbed biodynamic of the cervical spine is also observed to be associated with development of premature degenerative changes and narrowing of the contralateral neural exit foramen. These may account for the clinical finding of tenderness at this level. Radiographic findings of degenerative changes also reinforce the impression of the long standing nature of the condition.

The embryogenesis of this anomaly has been described by Archer et al. (16). By the first four weeks of gestation the elements of multiple organs are formed and by eight weeks organogenesis is completed. It is during this period that the processes involved in the development of the cervical spine take place. This includes migration, segmentation and chondrification. Each vertebra has six chondrification centres: two form the vertebral bodies; two the pedicles, lateral masses, and transverse processes; and two form the lamina and spinous processes. These chondrification centres are formed by seven weeks, and ossification of the centrum and lamina begins at nine weeks of gestation. Failure of the development of a vertebral chondrification centre for the posterior arch of a particular sclerotome or failure of appropriate ossification can lead to the absence of a pedicle. Absent pedicle syndrome results from the failure to develop ventral chondrification centres at seven to eight weeks of gestation (16).

An enlarged neural foramen can also be caused by dumbbell-shaped spinal tumours, bone tumours, bone erosion by a tortuous or aneurysmal vertebral artery, meningocele and fractures.

The dysplastic reversed facet can be mistaken for a facet fracture-dislocation in traumatized patients so careful inspection of cervical spine radiographs is essential. With the knowledge of the characteristic radiological findings in patients with an absent cervical spine pedicle the proper diagnosis should be made in most cases. If, however, the diagnosis is uncertain, which can often be the case in

traumatized patients, a three-dimensional computed tomography scan is useful for evaluating the anomaly. Three-dimensional CT scan reconstruction can provide comprehensive images of bony structures so it should be performed in situations in which the diagnosis is uncertain.

Conservative therapy is recommended for patients with congenital absence of a cervical spine pedicle, as it is successful in most cases.

TEACHING POINT

Appropriate knowledge and awareness of the congenital absence of a cervical spine pedicle can prevent inappropriate management and three-dimensional computed tomography can help confirm the diagnosis in equivocal cases.

ABBREVIATIONS

CT: computed tomography
MRI: magnetic resonance imaging

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FIGURES

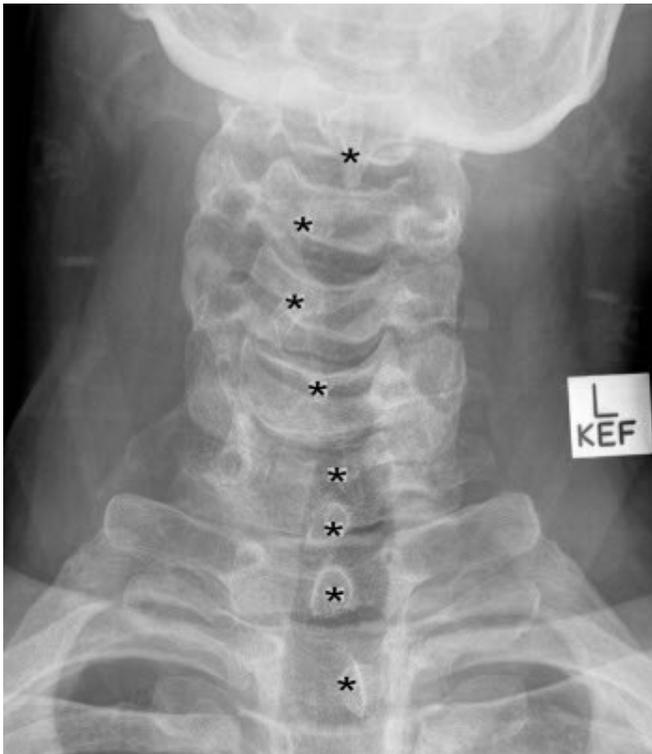


Figure 1: 35-year-old male with congenital absence of the right C6 pedicle. AP radiograph of the cervical spine. Asterisks mark the spinous processes of the cervical spine. There is deviation of the alignment of the spinous processes from the midline due to discordant rotation centered at C5/6 level. There is associated tilting of the patient's head to the left.



Figure 2: 35-year-old male with congenital absence of the right C6 pedicle. Plain lateral radiograph of the cervical spine. The articular processes are normally well appreciated on the lateral radiograph as outlined (arrow heads). However, in this patient, there is loss of definition of the C6 articular processes (arrow) due to dorsal displacement of the right C6 articular pillar.

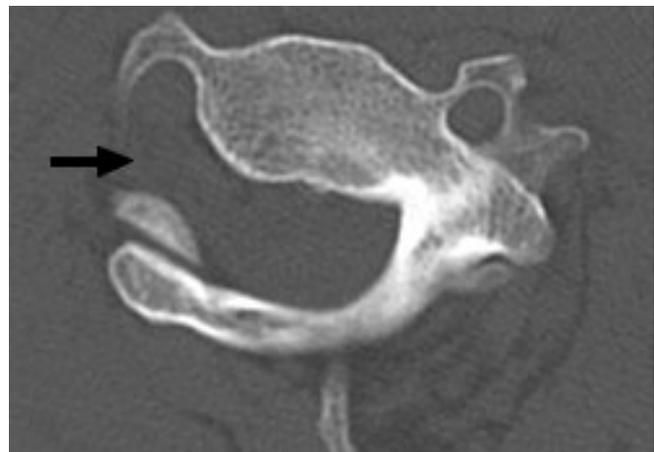


Figure 3: 35-year-old male with congenital absence of the right C6 pedicle. Select axial image of computed tomography shows absence of the right pedicle (arrow). The adjacent bones, in particular the right articular pillar, are well corticated with no fracture lines or adjacent soft tissue swelling is suggest an acute injury. The absence of the pedicle is also associated with dorsal defect of the right foramen transversorium at the same level.

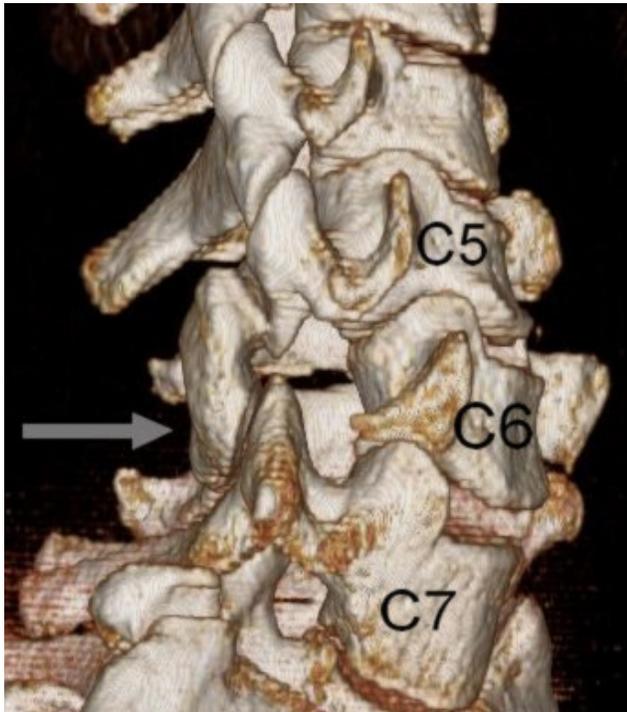


Figure 4: 35-year-old male with congenital absence of the right C6 pedicle. Magnified CT 3D reformat of the C5/6 level demonstrates the dorsally displaced right articular pillar. There is pseudoarthrosis between the anterosuperior tip of the C6 pillar with the inferior articular process of C5. There is normal articulation at the C6/7 level (arrow). The absence of the right C6 pedicle results in an enlarged right neural exit foramen which encompasses both the exiting C6 and C7 nerve roots.

KEYWORDS

Congenital defects, Cervical vertebrae, Computed tomography

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