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Absent congenital cervical pedicle nearly misdiagnosed as a facet dislocation: A case report

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Abstract

Background—Cervical spinal injury encompasses up to 1.5% of all pediatric injuries. Children, and more specifically infants, are a difficult subset of patients to obtain neurological exam in the setting of trauma, thus necessitating the use of cervical X-rays, CT scans, and MRI imaging.

Case description—A healthy, 15-month-old boy had an unwitnessed fall down a flight of stairs and received a CT scan of the head and cervical spine in the emergency department due to cephalohematoma and mechanism of injury. The patient was initially diagnosed with a unilateral facet dislocation but after additional imaging and rigorous interdisciplinary discussions, the patient was correctly diagnosed with a congenitally absent left C5 pedicle. Surgical intervention was not pursued and the patient was discharged home with close follow up.

Conclusion—In the acute trauma setting, congenital absent cervical pedicle can be difficult to differentiate from unilateral facet dislocation and may require the use of advanced imaging and close communication between the neurosurgery and radiology departments. Given the high morbidity and mortality involved in the repair of facet dislocation in a child, it is crucial to maintain high degree of clinical suspicion for absent spinal pedicle. In this case, the patient nearly underwent surgical intervention, but was ultimately able to be discharged home with no symptoms or deficits after correct diagnosis.

Keywords

Cervical spine injury; Deformity; Congenital; Absence; Pedicle; Trauma; Pediatrics

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1. Introduction

Cervical spine injuries (CSI) in the pediatric patient population can be morbid and/or even fatal [15, 18]. The cervical spine is involved in 1 to 1.5% of all pediatric injuries with sports related injuries and ground level falls accounting for 73% of all pediatric CSI [4, 10, 19, 26].

Pediatric CSI poses unique diagnostic challenges for clinicians. Due to the difficulty in obtaining a comprehensive neurologic exam in an injured child, diagnostic radiographic imaging such as computerized tomography (CT) and magnetic resonance imaging (MRI) scans may often be warranted [9]. Occasionally, congenital anomalies of the cervical spine (1/40,000 births) and areas of maturation of cervical ossification centers may be misinterpreted as CSI [11]. Therefore, a thorough understanding of pediatric cervical anomalies and maturation patterns of the cervical spine necessitates a high degree of clinical suspicion in the trauma setting to avoid unnecessary surgical interventions.

In this manuscript, we describe a case of a child who presented to our hospital after a CSI. Due to difficulties in obtaining an accurate neurologic exam, the patient underwent a CT scan of the cervical spine, which revealed a unilateral congenital absence of the left C5 pedicle. At the time, this finding was misinterpreted as a unilateral facet dislocation nearly resulting in an open reduction and internal fixation of the assumed lesion.

2. Case description

Following a traumatic unwitnessed fall down a flight of stairs at home, a 15 month old boy with no pertinent past medical or developmental history was brought to the emergency department. Upon arrival, the patient was awake, alert, crying and moving all extremities equally and spontaneously. Due to a small frontal cephalohematoma noticed during physical exam, the patient underwent a non-contrast head CT, which was unremarkable. A cervical spine CT was also performed which demonstrated a normal cervical lordosis without evidence of vertebral spondylolisthesis, however, a finding of a left C5/C6 jumped facet was revealed. On closer inspection, the left inferior articular process of C5 was seen displaced anteriorly in relation to the superior articular process of C6 (Figs. 1, 2, 3, 4, 5).

A rigid cervical collar was placed in the field due to mild tenderness to palpation of the cervical spine. Neurologically, the patient had a good cry, good suck, moved all extremities, had normal strength/tone, and normal patellar reflexes. The neurosurgery service was consulted for further recommendations. At this time, there was substantial consideration to take the patient to surgery given the findings on CT scan. However, given the discrepancy between the patient's benign neurologic exam and findings on imaging, surgery was deferred and a magnetic resonance imaging (MRI) scan of the cervical spine was obtained. A deformity along the left C5 and C6 lateral masses were again noted which was thought to represent a unilateral jumped facet. There was no evidence of vertebral body translation (as would be seen in dislocation), no significant spinal canal stenosis or cord compression and further review of the CT and MRI scans with a neuroradiologist led to a diagnosis of congenital absence of the left C6 pedicle. At this time it was decided that the patient did not require any surgical intervention. Upon discharge and on follow up, the patient was

asymptomatic, had no deficits on neurological exam and was able to move all extremities with full range of motion and ambulate without assistance.

3. Discussion

Pediatric CSI is a unique and complex clinical entity due to a combination of factors including ligamentous hyperlaxity, immature ossification centers, and head/body size discrepancy seen in young children [3, 21]. During the evaluation of pediatric CSI, absent cervical spinal pedicles (ACSP) may be missed in lieu of falsely diagnosing unilateral facet subluxation or dislocation. Though rarer than CSI, recognizing ACSP is crucial to avoid unnecessary interventions. ACSP is an entity that was first documented in 1946 when Hadley et al. presented 3 cases of incidental ACSP in adults [7]. Since then, approximately 70 cases have been reported in the literature. The majority were incidentally discovered upon imaging workup in the setting of cervical trauma [23]. ACSP can be associated with other osseous abnormalities such as spina bifida occulta, vertebral body/arch fusion, or additional pedicles [6]. Due to the necessity of avoiding unnecessary medical or surgical intervention, Fowler et al. proposed a triad of findings on CT scan to help clinicians identify ACSP: 1) false appearance of enlarged ipsilateral neural foramen due to absent pedicle; 2) dysplastic dorsally displaced ipsilateral articular pillar and lamina; 3) dysplastic ipsilateral transverse process (Figs. 1, 2, 3) [6].

Though the true prevalence and incidence of ACSP may be difficult to ascertain given its rarity, an excavation of 687 skeletons in a medieval English village produced 1 case of ACSP in a young adult male [14]. The C6 pedicle is most often affected and the most common symptom is neck pain [25]. Although the underlying mechanisms behind ACSP have not been elucidated, it is theorized that failure of development of a vertebral chondrification center in the posterior arches or failure of ossification could prevent pedicle formation and lead to the abnormality.

In the absence of other injuries or neurologic deficit, ACSP does not require intervention other than pain control and expectant management [23]. Though the majority of ACSP cases reported in the literature were not treated operatively, it is important to note there were some instances where patients underwent cervical traction and surgical intervention [26]. The authors noted that the patients did not show clinical improvement and may have actually worsened after traction. Additionally, Sakou et al. described a case of a patient who underwent surgery for an absent cervical pedicle, diagnosed after a motor vehicle accident, who initially had symptomatic improvement in her cervical pain and right extremity tingling but later had recurrence in the neck pain postoperatively [22].

In this illustrative case, both mechanism of injury and midline cervical spinal tenderness led to a non-contrast head and cervical spine CT in the emergency department. As with any pediatric CSI, history and physical examination are crucial in the evaluation and are often followed by one or several radiologic studies [1]. There are not many established guidelines on decision making regarding imaging in younger trauma patients but Pieretti Vanmarcke et al. utilized four clinical predictors to clear the cervical spine without imaging in children: motor vehicle crash, age > 2, GCS < 14, and GCS (Eye) = 1 [20]. Of the 12,537 patients (all

< 3 years of age) examined in the study, 83 patients (0.66%) had CSI, and 8 had spinal cord injury.

Standard 3 view X-rays of the cervical spine are typically sufficient to reveal ACSP [8, 24]. However, CT scan is increasingly being performed as the first-line diagnostic imaging modality in most emergency rooms in the United States [13]. 3D CT scan reconstructions can more clearly outline the absent spinal pedicle as well as other osseous abnormalities as mentioned above [2, 5, 12, 16, 17]. If the pediatric patient is under 5 years of age, MRI should be considered as the first line imaging modality given the higher frequency of ligamentous injury and radiation induced effects in this age group.

4. Conclusion

ACSP is a rare entity that is most commonly discovered as an incidental finding after trauma. To the untrained eye, ACSP can be easily misdiagnosed as facet dislocation [11]. In this case, the correct diagnosis was made only after both CT and MRI of the cervical spine were completed and thorough evaluation of the imaging studies with a multidisciplinary team was performed. Ultimately, the patient did not undergo traction or surgery and was discharged in stable fashion with close follow up. Nonetheless, cervical imaging must be scrutinized closely in the pediatric population and a high degree of suspicion of congenital anomalies must be implemented in the setting of a normal neurological examination.

Abbreviation

ACSP	absent cervical spinal pedicle
CSI	cervical spine injury
CT	computerized tomography
GCS	Glasgow Coma Scale
MRI	magnetic resonance imaging

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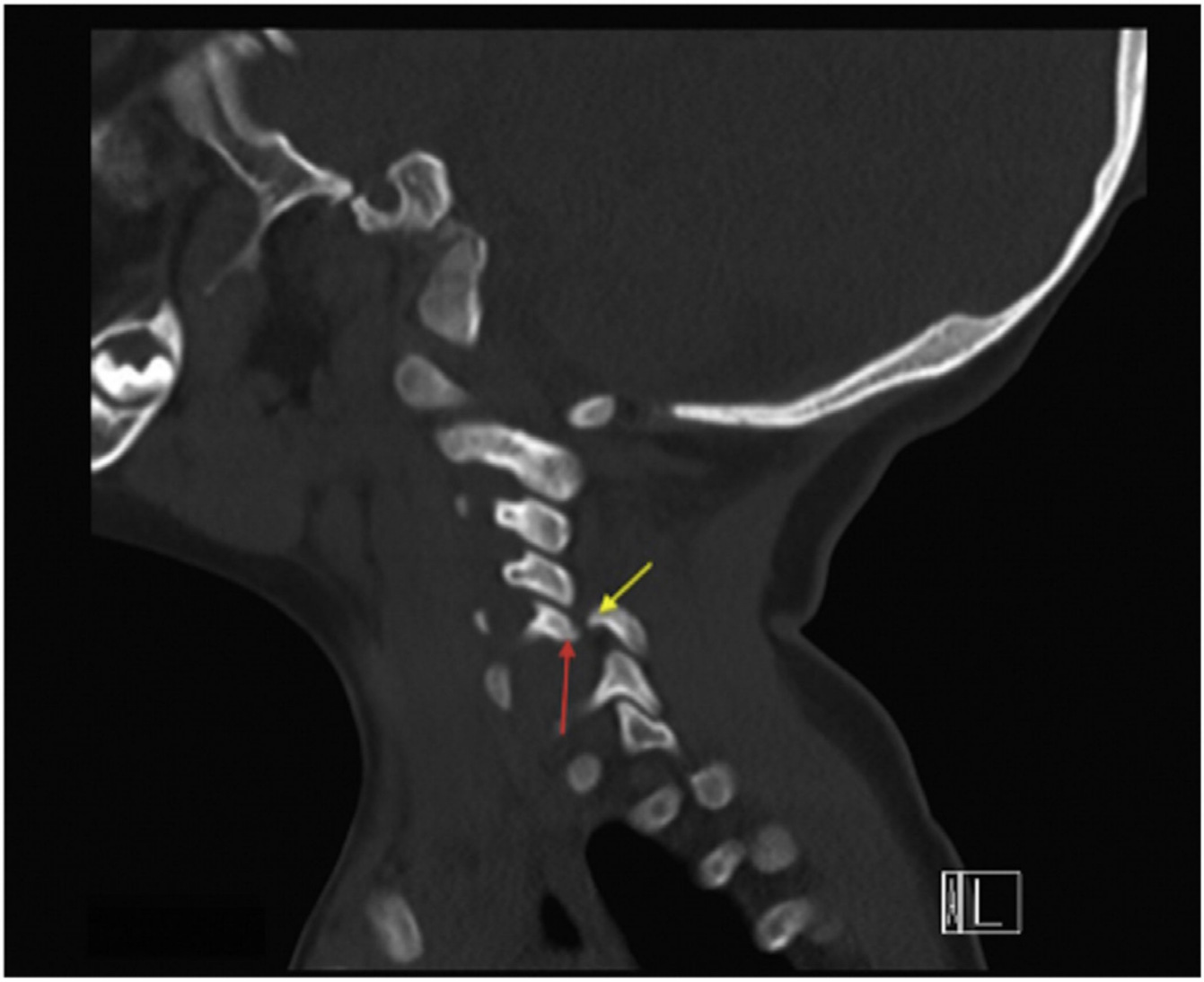

Fig. 1.
Sagittal CT scan of the cervical spine demonstrating the absent left pedicle at C5 and a dysplastic dorsally displaced ipsilateral articular pillar and lamina.

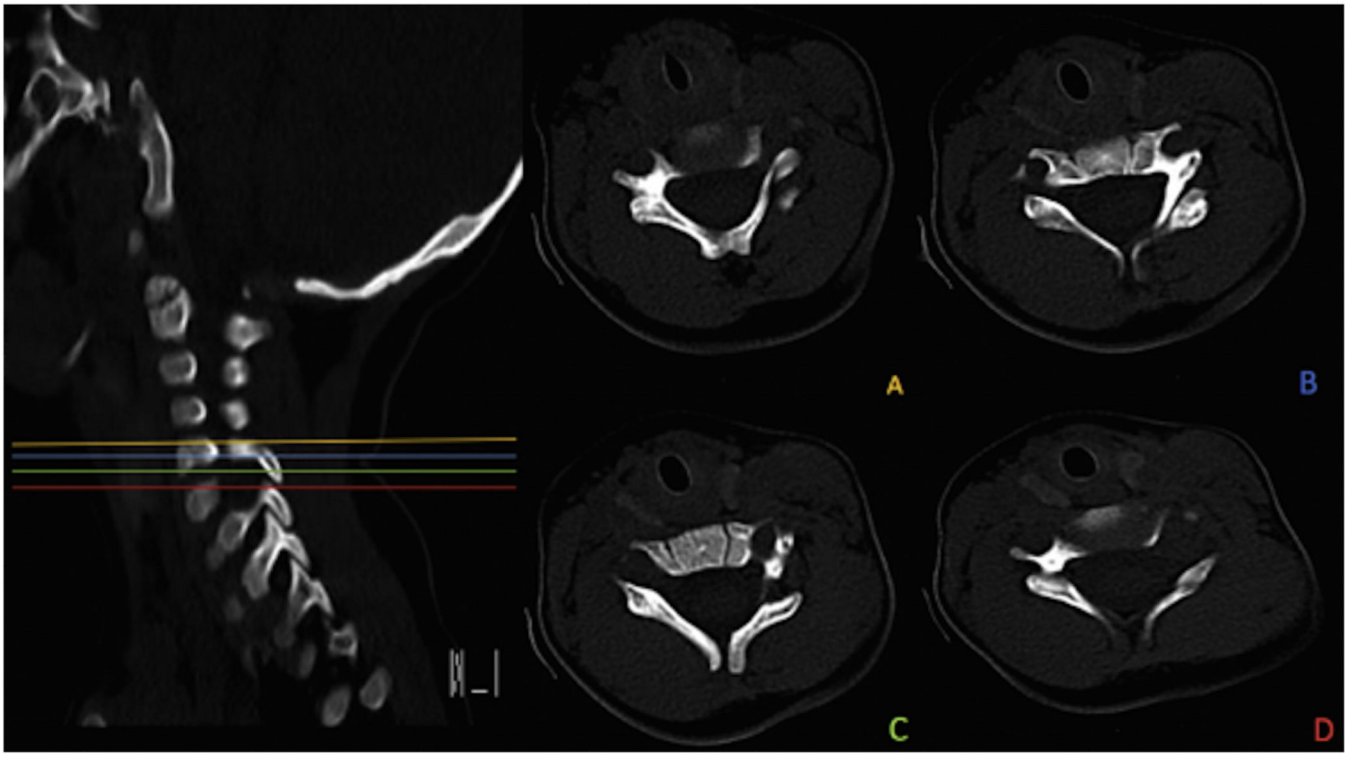

Fig. 2.

Sequential axial views from a sagittal CT scan through the cervical spine demonstrating the absent left pedicle, false appearance of enlarged ipsilateral neural foramen due to absent pedicle and dysplastic ipsilateral transverse process (Fowler's Triad) [6]. The colored vertical lines in the sagittal view correspond to the corresponding color in the axial view.

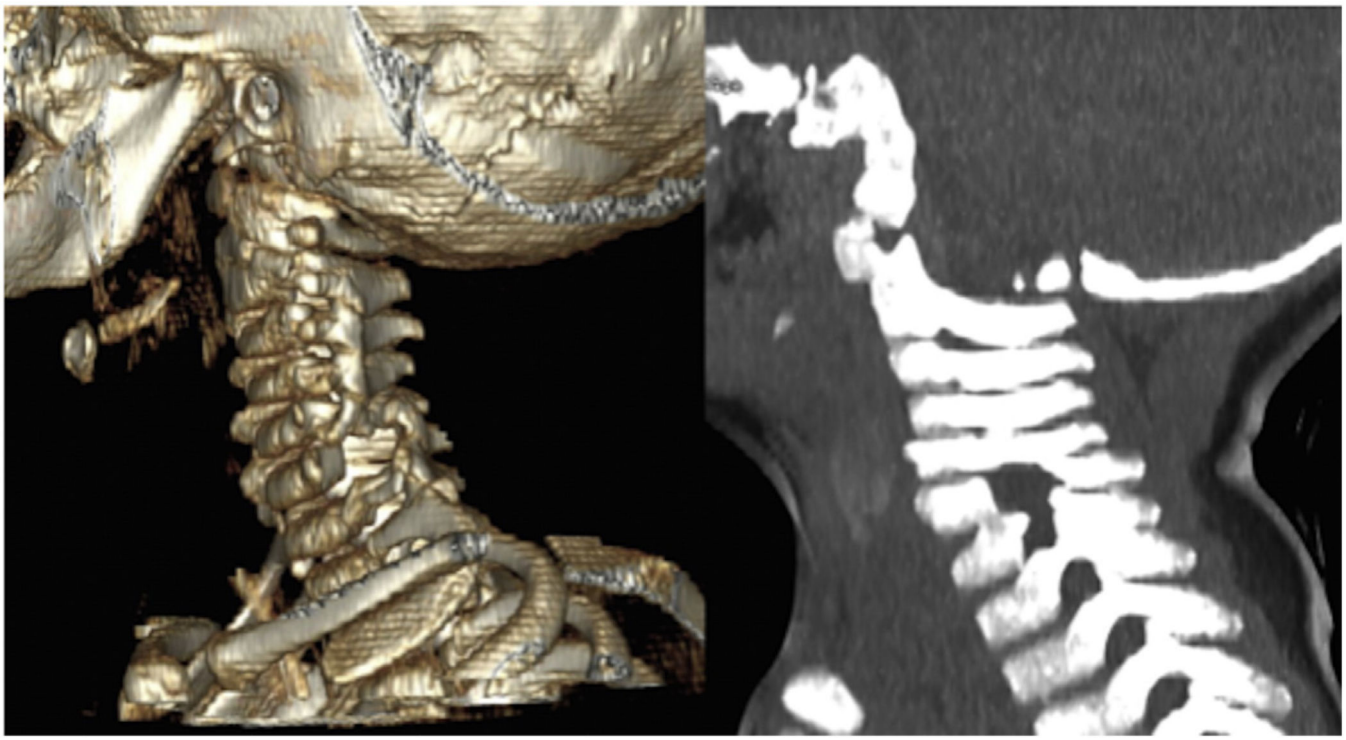

Fig. 3.
Sagittal 3D-reconstructed view demonstrating normal cervical alignment post-trauma and the absent pedicle at C5 (left-side).

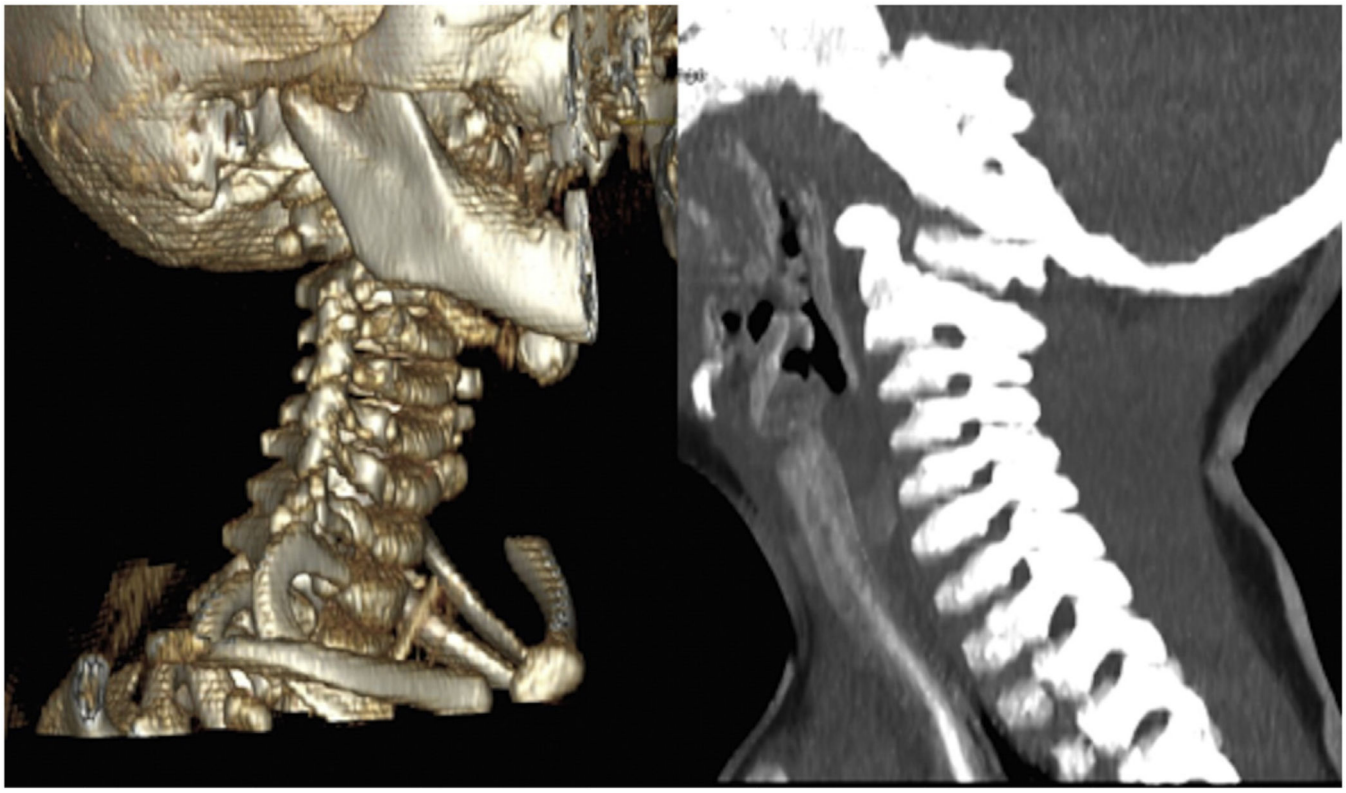

Fig. 4.
Sagittal 3D-reconstructed view demonstrating normal alignment and intact pedicles on the patient's right-side.

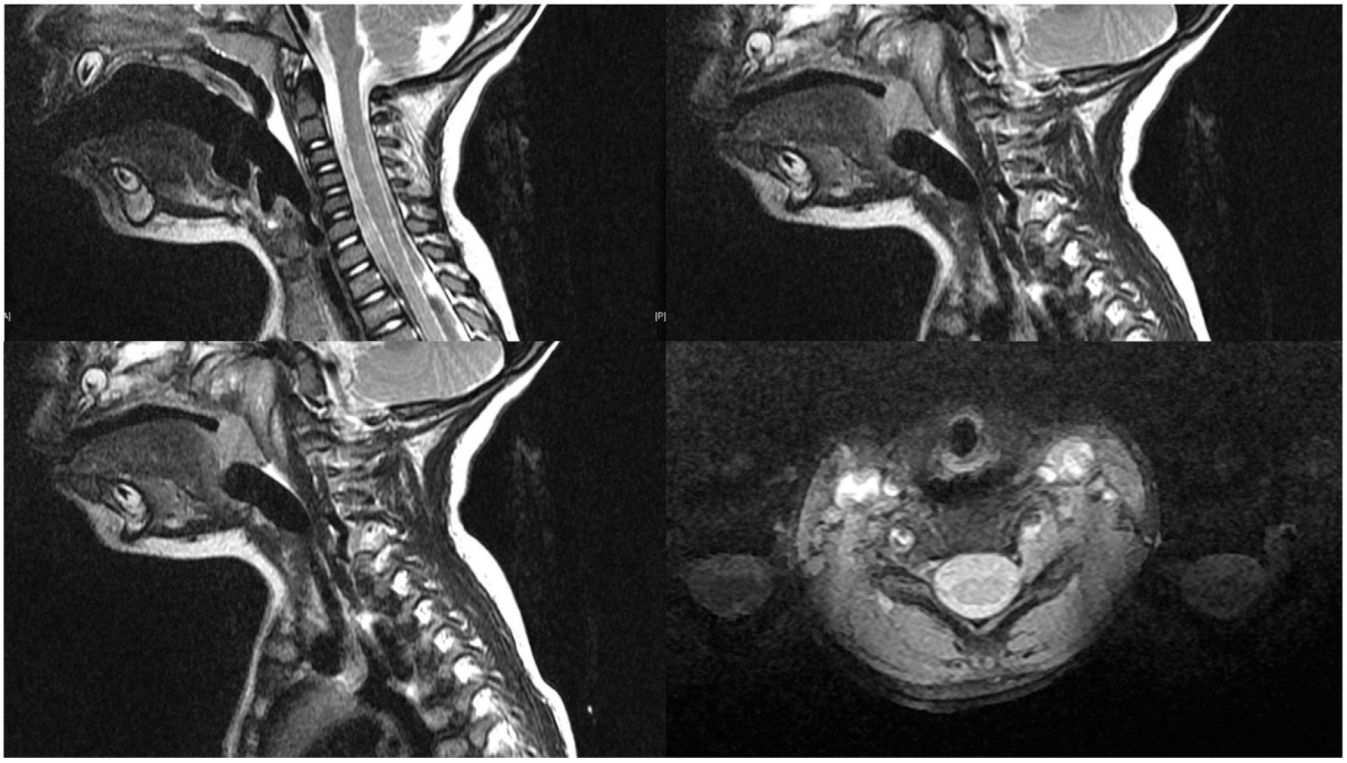

Fig. 5.

T2-Weighted MRI scans of the cervical spine. (A) Midline sagittal view of the patient's cervical spine demonstrating normal alignment without evidence of fracture or cord compression (B) Left parasagittal view demonstrating the absent left C6 pedicle (C, D) The same left parasagittal view with an orange line demonstrating the region of interest (axial view in panel D) at the region of the absent left C6 pedicle (D) axial T2-weighted view demonstrating the absent left pedicle at C6, no evidence of fracture, dislocation, or compression of the spinal cord.